

Water Quality Standards Information for the Great Lakes Inventory and Monitoring Network

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Great Lakes Inventory and Monitoring Network
2005**

**Great Lakes Network Report
GLKN/2005/12**

Suggested citation:

Ledder, T. 2005. Water quality standards information for the Great Lakes Inventory and Monitoring Network. National Park Service Great Lakes Inventory and Monitoring Network Report GLKN/2005/12.

EXECUTIVE SUMMARY

This report was prepared to meet the informational needs of the water quality monitoring project for data interpretation. Water quality standards for each of the four states in the Great Lakes Inventory and Monitoring Network (GLKN) were reviewed for numeric criteria. Designated uses for waterbodies in each park were researched and listed where possible. The water quality criteria pertaining to designated uses were summarized for parameters of interest to the water quality monitoring project.

There are nine GLKN parks. Apostle Islands National Lakeshore (APIS) is located in Wisconsin. St. Croix National Scenic Riverway (SACN) and Mississippi National River and Recreation Area (MISS) are located in or border both Wisconsin and Minnesota. Grand Portage National Monument (GRPO) and Voyageurs National Park (VOYA) are located in Minnesota. Isle Royale National Park (ISRO), Pictured Rocks National Lakeshore (PIRO) and Sleeping Bear National Lakeshore (SLBE) are located in Michigan. Indiana Dunes National Lakeshore (INDU) is located in Indiana.

As states must develop water quality criteria as protective as Clean Water Act requirements, but may develop stricter criteria, listed values for states may not match the EPA Numeric Criteria list. Therefore, each state's water quality standards will not be the same as the bordering state's. The differing designated use classifications and table structures make it difficult to compare one state's criteria to the others. Water quality data from each park, therefore will have to be compared to the criteria for the state in which the park is located, using information on the designated uses of each waterbody.

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INTRODUCTION

This report was prepared to provide information on state water quality criteria for the four states within the Great Lakes Network (IN, MI, MN, WI). Criteria of interest to the GLKN for the Phase 3 report and FY05 workplan include turbidity, dissolved oxygen, pH, alkalinity, nitrite, nitrate, nitrite+nitrate, sulfate, chloride, fluoride, beryllium, cadmium, copper, zinc, mercury, lead, silver, cyanide, nickel, coliform, fecal coliform, and *E.coli*.

There are nine GLKN parks. Apostle Islands National Lakeshore (APIS) is located in Wisconsin. St. Croix National Scenic Riverway (SACN) and Mississippi National River and Recreation Area (MISS) are located in or border both Wisconsin and Minnesota. Grand Portage National Monument (GRPO) and Voyageurs National Park (VOYA) are located in Minnesota. Isle Royale National Park (ISRO), Pictured Rocks National Lakeshore (PIRO) and Sleeping Bear National Lakeshore (SLBE) are located in Michigan. Indiana Dunes National Lakeshore (INDU) is located in Indiana.

Under the Clean Water Act, the states must develop water quality standards at least as stringent as federal guidelines. As each state writes its own standards based on its own designated uses, states' criteria are not uniform. Federal numeric criteria include only toxicological limits for organic and inorganic chemicals to provide, at minimum, protection of fish and aquatic life and human health and do not tie to any specific designated uses or antidegradation policies.

Waterbodies within each national park, therefore, must meet the standards and criteria of the state within which they are located. The recommendation section of this report includes information on criteria for the parameters listed above by state. The appendices include information on the designated uses of waterbodies within each park. With this information GLKN will be able to track exceedances of water quality criteria for each waterbody monitored in each park.

As regulations, water quality standards evolve. Every three years, each state reviews and updates its water quality standards. The Environmental Protection Agency is currently assisting the states in developing nutrient criteria and microbial indicator criteria, among other projects. This report summarizes what is known and applies to the GLKN monitoring project in early 2005. Although the states display their administrative codes on their websites and the USEPA website documents all of the states' water quality standards to some extent, the only legally binding water quality standards are the documents printed in the Federal Register.

This report provides information specific to numeric and narrative criteria that builds on information gathered in the 2003 Water Information and Assessment Report (Ledder 2003). Table 1 summarizes the information previously gathered in the NPS "Baseline Water Quality Inventory and Analysis Reports" (Ledder 2003).

Table 1. Summary of threats to water resources at the nine National Park Service units in the Great Lakes Inventory and Monitoring Network

Park	State	Data	Threats to water resources	Documented problem parameters*	Waterbody legal status#
Apostle Islands National Lakeshore (APIS)	WI	1968-1996	Appears to be good quality. Atmospheric deposition and water traffic/recreational use. Highly erodible soils and often severe spring runoff.	None documented	None designated
Grand Portage National Monument (GRPO)	MN	1968-1995	Appears to be good. Relatively little water quality data. Atmospheric deposition, recreational use, wastewater, runoff, and surrounding land uses of mining and logging.	None documented	303(d) listed waters
Indiana Dunes National Lakeshore (INDU)	IN	1935-1992	Impacted by industrial/municipal effluents, surface runoff, sulfur and nitrous oxides, altered hydrologic processes, exotic species, and drain and fill of wetlands.	PCBs, PAHs, metals, pesticides, fuels and oils, indicator bacteria, biota	OSRW waters 303(d) listed waters
Isle Royale National Park (ISRO)	MI	1962-1987	Appears to be very good quality. Atmospheric deposition, visitor activities, and waste.	Mercury, PCBs	303(d) listed waters Whole park OSRW
Mississippi National River and Recreation Area (MISS) ⁺	MN	1926-1994	Heavily impacted by industrial/municipal wastewater discharges, stormwater runoff, commercial and residential development, contaminated sediments, and erosion.	Dissolved oxygen, metals, indicator bacteria	303(d) listed waters Headwaters ORW
Pictured Rocks National Lakeshore (PIRO)	MI	1968-1984	Appears to be good quality. Atmospheric deposition, surrounding land use practices and development, invasive species, and viewshed impacts.	None documented	303(d) listed lake Whole park ORW
St. Croix National Scenic Riverway (SACN) ⁺	WI	1926-1995	Impacted by development, industrial/municipal wastewater discharges, surface runoff, agriculture, cranberry industry, and recreational use.	Dissolved oxygen, metals, indicator bacteria	ORW rivers 303(d) listed lakes and flowages on the rivers
Sleeping Bear National Lakeshore (SLBE)	MI	1962-1996	Appears to be good quality. Septic leakage, wastewater, runoff, and recreational use.	None documented	303(d) listed lakes Whole park OSRW
Voyageurs National Park (VOYA) ⁺	MN	1967-1991	Appear to be of good quality. Atmospheric deposition, human use and adjacent land uses. Naturally occurring low yield aquifers may limit groundwater use.	Mercury, PCBs, fuels, waste water	Whole park ORW

*Denotes historic data gathered in “Baseline Water Quality Inventory and Analysis Reports”.

Denotes Water Quality Standards and state lists

⁺Park not in Great Lakes Basin

METHODS

Water quality standards for each of the four states in the GLKN were accessed on the Environmental Protection Agency's Water Quality Standards Database (EPA 2005a) and/or the States' websites. Each state's water quality standards were reviewed for numeric criteria. Designated uses for waterbodies in each park were researched and listed where possible. State Trout Stream designations were researched for identification of cold water fisheries. The water quality criteria pertaining to designated uses were summarized in tables. This report makes recommendations for interpretation of water monitoring data based on water quality standard criteria for each state. This information will be used in the future in a database of GLKN monitoring data.

As states must develop criteria as protective as Clean Water Act requirements, but may develop stricter criteria, listed values for states may not match the Environmental Protection Agency (EPA) Numeric Criteria list (EPA 2005). Where values differ, the stricter limit should be used in NPS monitoring data interpretation on the National Parks. Where a state has not developed its own state-specific criteria for a specific parameter according to the regulatory methods, it will default to the federal numeric criteria (Appendix E). Therefore, the state's lists are not identical to one another. The EPA's Water Quality Standards Database is slowly expanding. As of this writing, it includes completely tabulated information for 30 states in the nation. Most of the states' water quality standard information includes designated uses definitions that are not yet linked to maps of waterbodies or waterbody lists. These informational websites and the actual water quality standards are updated periodically, however, the only legally binding documents are those published in the Federal Register.

The contractor and GLKN staff agreed that for this project a database of water quality standards was not feasible. In the future, as the GLKN gathers data on water quality, a database will be created that will allow searches/comparisons to state and designated use appropriate criteria, with each state's criteria tabled separately.

RESULTS AND DISCUSSION

Water Quality Standards

States and Tribes have been given the authority to develop water quality standards at least as protective as federal EPA regulations. Water quality standards consist of designated uses for each waterbody, narrative and numeric criteria to protect those uses, and antidegradation policies as well as state specific procedural rules. Section 303(c) of the Clean Water Act establishes the basis for the water quality standards program, including oversight of state standards by the Environmental Protection Agency (EPA). Each state keeps a 303(d) list of waters that are not meeting water quality criteria. These lists are reported to the Environmental Protection Agency (EPA).

Narrative criteria are often referred to as the "free froms". States' narrative criteria may differ. The following example comes from Indiana's water quality standards. "The following are minimum water quality conditions: All waters within the Great Lakes System at all times and places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

- a) Will settle to form putrescent or otherwise objectionable deposits.
- b) Are in amounts sufficient to be unsightly or deleterious
- c) Produce color, visible oil sheen, odor, or other conditions in such degree as to create a nuisance

- d) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to create a nuisance, be unsightly, or otherwise impair the designated uses.
- e) Are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill aquatic life, other animals, plants, or humans".

Numeric criteria quantify the narrative criteria and define what concentration will prevent the deleterious effects as outlined in the narrative criteria. Numeric criteria are calculated from a suite of toxicological studies or existing literature studies that meet the requirements as defined by the Clean Water Act. States in the Great Lakes region follow the Great Lakes Initiative (40 CFR 132) Guidance in developing criteria for toxic pollutants based on laboratory and field studies and in limiting emissions of bioaccumulative contaminants of concern (BCCs). Each state may calculate its own state specific numeric criteria or incorporate the USEPA listed value for any chemical. Most numeric criteria are currently in the form of acute and chronic maximum allowable concentrations for toxic pollutants; many relate to discharge limits.

Waterbodies in most of the parks in the GLKN are designated as Outstanding Resource Waters. This is an antidegradation category for high quality waters in which that high quality must be maintained. States list antidegradation policies within their water quality standards. These policies outline the necessary procedures for decision making on development and/or new discharges that may affect waterbodies in specific antidegradation categories.

Other developing criteria

States around the nation are currently developing nutrient criteria, as non-point source pollution has become the most significant threat to surface waters. Indiana, Michigan, Minnesota, and Wisconsin are in the process of submitting plans to the USEPA for development of state specific nutrient criteria. Each state plans to complete nutrient criteria for lakes and reservoirs and streams and rivers between 2006 and 2008 (EPA September 2003).

In 2001, USEPA published a mercury water quality criterion based on fish tissue residue concentrations (0.3 mg methylmercury/kg fish). This water quality criterion differs from state fish consumption advisories, which advise individuals how many meals of fish from specific water bodies they can safely consume per month. The water quality criterion is based on the mercury reference dose (0.0001 mg/kg body weight/day) and fish intake averages (EPA 2001). Not all states have incorporated this criterion in their water quality standards.

States with fresh water coasts are required to adopt *E. coli* as the water quality indicator for recreational contact (Beaches Environmental Assessment and Coastal Health Act of 2000; BEACH Act). This Act, based on the 1986 bacteria criteria report, replaces past recommendations for using fecal coliforms as the primary indicator. Wisconsin and Minnesota are currently in the process of adopting these rules, and Indiana and Michigan have adopted these rules or other rules that are as protective (EPA 2004).

Changes in current Water Quality Standards

Water Quality Standards are reviewed by each State or Tribe every three years, at which time any newly identified criteria may be added and the regulation otherwise changed if necessary. A public comment period according to federal rules is followed after the EPA's review of the draft changes. The GLKN should get on the list for public notification in WI, IN, MI, and MN in order to receive this information, or periodically review the Water Quality Standards Database. Contact David Pfeiffer, Region V Water Quality Standards Program, at (312) 353-9024 for more information.

The Grand Portage Band of Chippewa has draft Water Quality Standards awaiting USEPA approval. Government to government cooperation is required in federal projects with all tribes. The National Park Service should communicate plans for sampling, request permission for data sharing, and to access the Reservation when GRPO is to be monitored for any project. The final approved water quality standards can be requested from the Tribe or Region V EPA. Written communication and coordination may be required. Contact Curtis Gagnon, Margaret Watkins, or Brad Frazier at Grand Portage Trust Lands, PO Box 428, Grand Portage, MN 55605 or (218) 475-0194 for information.

RECOMMENDATIONS

The following tables summarize each states' water quality criteria for the GLKN water quality monitoring project parameters of interest. The water data for each waterbody monitored should be compared to the criteria for the appropriate designated use in the appropriate state. Some designated uses depend on the actual existing use and are not tabulated in the state water quality standards. These include public water supplies. Some of the waterbodies in parks in GLKN are used for a public water supply, such as MISS and SACN. Criteria for many parameters are different for aquatic life and human health.

The lists of waterbody classifications, trout streams, outstanding resource waters (ORWs), and 303(d) listed waters are in different formats in each state. For example, Wisconsin lists trout streams (a determination of a cold water community designated use) by county, but lists exceptional resource waters (an antidegradation classification) by Township, Range, and Section. The contractor was unable to access any one media source with all of the above lists together with the park boundaries for any of the states. The GLKN has information for Township, Range, and Section of the parks in Wisconsin, but only Township and Range in Minnesota, Michigan, and Indiana (Ulf Gafvert, personal communication, 5/27/05). Creating a database of all of this information in one map would facilitate the tracking of results of the monitoring project.

Many of the criteria for metals concentrations depend on the hardness of the water sampled. In order to determine if a waterbody is meeting these metal criteria, hardness will have to be determined as well. Originally, water hardness was understood to be a measure of the capacity of a water to precipitate soap, chiefly due to calcium and magnesium, though other polyvalent cations may also contribute. There are two methods listed in Standard Methods for measurement of hardness, a calculation and an EDTA titration (a measurement of Ca and Mg ions together). The preferred method for determining hardness is to calculate it from the results of separate determinations of calcium and magnesium. (APHA 1998).

$$\text{Hardness, mg equivalent CaCO}_3/\text{L} = 2.497 [\text{Ca mg/L}] + 4.118 [\text{Mg mg/L}]$$

TABLE 2 Indiana Criteria for GLKN

Parameter (ug/L)	Aquatic Life	
	Criterion Maximum Conc.	Criterion Chronic Conc.
DO	Average at least 5.0 mg/L, not less than 4.0 mg/L any time Cold water – 7.0 mg/L during spawning, not less than 6.0 mg/L any time	
pH	6.0 to 9.0, except daily fluctuations correlated with photosynthetic activity	
E. coli (recreation)	MF not to exceed 125 CFU/100 mL as geometric mean of 30-day period, nor exceed 235/100mL in any one sample	
Coliform (water supply)	5,000 CFU/100mL as a monthly average (membrane filtration or most probable number)	
Chlorides or sulfates	Not to exceed 250 mg/L	
Nitrate-N and Nitrite-N*	Not to exceed 10 mg/L combined, nitrite-N not to exceed 1 mg/L	
Cadmium (total)	$e^{(1.128[\ln \text{hardness}] - 3.6867)}$	$e^{(0.7852[\ln \text{hardness}] - 2.715)}$
Copper (total)	$E^{(0.9422[\ln \text{hardness}] + 1.700)}$	$e^{(0.8545[\ln \text{hardness}] - 1.702)}$
Mercury	1.694	0.9081
Mercury (incl. meHg)	Human noncancer value = 0.0018	
Nickel (total)	$e^{(0.846[\ln \text{hardness}] + 2.255)}$	$e^{(0.8469[\ln \text{hardness}] + 0.0584)}$
Zinc (total)	$e^{(0.8473[\ln \text{hardness}] + 0.884)}$	$e^{(0.8473[\ln \text{hardness}] + 0.884)}$
Chlorides	860000	230000
CN	22	5.2

*This criterion is based on limits for health in drinking water and not on aquatic life

Note: hardness is in mg/L, dissolved metals concentrations may be calculated using IN Table 8-1 (Appendix B)

TABLE 3 Michigan Criteria for GLKN

Parameter (ug/L)	Aquatic Life	
	Acute	Chronic
DO	Cold water fisheries minimum of 7.0 mg/L, low flow minimum of 6.0 mg/L All others maintain 5.0 mg/L, 4.0 mg/L at low flows	
pH	Maintain natural range of 6.5 to 9.0, no artificial variations greater than 0.5 units	
E. coli	All waters are protected for full body recreation 5/1-10/31, 30-day geometric mean of 130 CFU/100 mL (one time maximum of 300). Partial body contact maximum 1000 CFU/100mL	
Turbidity	Dissolved solids not greater than 500 mg/L average (750 mg/L any time)	
Cadmium (total)	$e^{(1.128[\ln \text{hardness}] - 3.6867)}$	$e^{(0.7852[\ln \text{hardness}] - 2.715)}$
Copper (total)	$e^{(0.9422[\ln \text{hardness}] - 1.7)}$	$e^{(0.8545[\ln \text{hardness}] - 1.702)}$
Zinc (total)	$e^{(0.8473[\ln \text{hardness}] + 0.884)}$	$e^{(0.8473[\ln \text{hardness}] - 0.884)}$
Mercury	1.4	0.77
Mercury Human Non-cancer value	0.0018 ug/L	

Note: Hardness is reported in mg/L, dissolved concentrations may be calculated using the conversion factors in MI Tables 1 and 2 (Appendix A)

TABLE 4 Minnesota Criteria for GLKN

Parameter (ug/L)	Class 2A - cold water habitat and drinking water source	
	Chronic Standard	Maximum Standard
DO	7.0 mg/L daily minimum	
pH	6.5 to 8.5	
Fecal coliforms	200 CFU/100 mL	
Cadmium (total)	$e^{(0.7852[\ln \text{hardness}] - 3.490)}$	$e^{(1.128[\ln \text{hardness}] - 3.8281)}$
Copper (total)	$e^{(0.620[\ln \text{hardness}] - 0.570)}$	$e^{(0.9422[\ln \text{hardness}] - 1.464)}$
Lead (total)	$e^{(1.273[\ln \text{hardness}] - 4.705)}$	$e^{(1.273[\ln \text{hardness}] - 1.460)}$
Mercury	0.0069	2.4
Nickel	$e^{(0.846[\ln \text{hardness}] + 1.1645)}$	$e^{(0.846[\ln \text{hardness}] + 3.3612)}$
Silver	0.12	$e^{(1.720[\ln \text{hardness}] - 7.215)}$
Zinc	$e^{(0.8473[\ln \text{hardness}] + 0.7615)}$	$e^{(0.8473[\ln \text{hardness}] + 0.8604)}$
Chloride	230	860
Turbidity	10 NTU	None
CN	5.2	22
Class 2Bd – cool water habitat and drinking water source		
DO	5.0 mg/L as a daily minimum	
pH	6.5 to 9.0	
Fecal coliforms	200 CFU/100 mL	
Cadmium (total)	$e^{(0.7852[\ln \text{hardness}] - 3.490)}$	$e^{(1.128[\ln \text{hardness}] - 0.9919)}$
Copper (total)	$e^{(0.620[\ln \text{hardness}] - 0.570)}$	$e^{(0.9422[\ln \text{hardness}] - 1.464)}$
Lead (total)	$e^{(1.273[\ln \text{hardness}] - 4.705)}$	$e^{(1.273[\ln \text{hardness}] - 1.460)}$
Mercury	0.0069	2.4
Nickel	$e^{(0.846[\ln \text{hardness}] + 1.1645)}$	$e^{(0.846[\ln \text{hardness}] + 3.3612)}$
Silver	1.0	$e^{(1.720[\ln \text{hardness}] - 7.215)}$
Zinc	$e^{(0.8473[\ln \text{hardness}] + 0.7615)}$	$e^{(0.8473[\ln \text{hardness}] + 0.8604)}$
Chloride	230	860
Turbidity	25 NTU	None
CN	5.2	22
Class 2B - cool water habitat		
DO	5.0 mg/L as a daily minimum	
pH	6.5 to 9.0	
Fecal coliforms	200 CFU/100 mL	
Cadmium (total)	$e^{(0.7852[\ln \text{hardness}] - 3.490)}$	$e^{(1.128[\ln \text{hardness}] - 1.685)}$
Copper (total)	$e^{(0.620[\ln \text{hardness}] - 0.570)}$	$e^{(0.9422[\ln \text{hardness}] - 1.464)}$
Lead (total)	$e^{(1.273[\ln \text{hardness}] - 4.705)}$	$e^{(1.273[\ln \text{hardness}] - 1.460)}$
Mercury	0.0069	2.4
Nickel	$e^{(0.846[\ln \text{hardness}] + 1.1645)}$	$e^{(0.846[\ln \text{hardness}] + 3.3612)}$
Silver	1.0	$e^{(1.720[\ln \text{hardness}] - 7.215)}$
Zinc	$e^{(0.8473[\ln \text{hardness}] + 0.7615)}$	$e^{(0.8473[\ln \text{hardness}] + 0.8604)}$
Chloride	230	860
Turbidity	25 NTU	None
CN	5.2	22

Note: hardness is in mg/L, dissolved metals concentrations may be calculated using values listed in MN water quality standards (Appendix C).

TABLE 5 Wisconsin criteria for GLKN

Parameter	Aquatic Life					
	Acute Toxicity Criteria		Chronic Toxicity Criteria			
DO	No less than 5.0 mg/L at any time, cold waters may not be artificially lowered to less than 6.0 mg/L, or 7.0 mg/L during spawning					
pH	6.0 to 9.0, no change greater than 0.5 units outside estimated natural seasonal maximum					
Fecal coliform	MF – no greater than 200 CFU/100mL geometric mean, nor exceed 400 CFU/100 mL in more than 10% of all samples during a month					
Cadmium (total)	$e^{(1.147[\ln \text{hardness}] - 3.8104)}$ cold water $e^{(1.147[\ln \text{hardness}] - 2.9493)}$ warm water		$e^{(0.819[\ln \text{hardness}] + 0.6851)}$ cold water $e^{(0.819[\ln \text{hardness}] + 1.112)}$ warm water			
Copper (total)	$e^{(0.8561[\ln \text{hardness}] - 1.1199)}$					
Lead (total)	$e^{(0.9662[\ln \text{hardness}] + 0.2226)}$					
Mercury	0.83					
Nickel (total)	$e^{(1.083[\ln \text{hardness}] + 2.2289)}$					
Zinc (total)	$e^{(0.8745[\ln \text{hardness}] + 0.7634)}$					
CN	22.4 cold water 45.8 warm water		5.22 cold water 11.47 warm water			
	Public water supply					
	Warm water	Cold water	Warm water	Cold water		
Cadmium	10	10	1200	1200		
CN	200	200	40000	40000		
Lead	10	10	140	140		
Mercury	0.0015	0.0015	0.0015	0.0015		
Nickel	100	100	43000	43000		
Silver	140	140	28000	28000		

Note: hardness is in mg/L, dissolved metals concentrations may be calculated using values listed in WI water quality standards (Appendix D).

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- Wisconsin Trout Streams, Publication 6-3600(80), Department of Natural Resources, Madison, WI 53707.

Appendix A

APPENDIX A

Summary of INDIANA Water Quality Standards Criteria

The numeric criteria applicable to the Indiana Dunes National Lakeshore are found in 327 IAC 2-1.5 Water Quality Standards Applicable to all State Waters within the Great Lakes System. (<http://www.epa.gov/ost/standards/wqslibrary/in/in.html>).

All surface waters of the state within the Great Lakes System are designated for full-body contact recreation and support of a well-balanced, warm water aquatic community. Where temperatures permit, surface waters shall be capable of supporting put-and-take trout fishing. The East Branch of the Little Calumet River and its tributaries and Salt Creek are designated by the state as cold-water salmonid waters. All waters of the Indiana Dunes National Lakeshore are otherwise designated Outstanding State Resource Waters and shall be maintained and protected in their present high quality without degradation.

327 IAC 2-1.5-8 Minimum Surface Water Quality Criteria

Water Quality for aquatic life

<u>Parameter</u>	<u>Criteria</u>
pH	6.0 to 9.0, except daily fluctuations correlated with photosynthetic activity
DO	average at least 5.0 mg/L, and not be less than 4.0 mg/L
Temperature	No abnormal temperature changes that may adversely affect aquatic life

Water Quality for cold water fishery

<u>Parameter</u>	<u>Criteria</u>
DO	not less than 6.0 mg/L at any time, not less than 7.0 mg/L during spawning.
Temperature	Rise above natural shall not exceed 2°F, nor exceed 70°F at any time, nor 65°F during spawning

Water Quality for full body recreational uses

<u>Parameter</u>	<u>Criteria</u>
<i>E. coli</i>	MF count shall not exceed 125/100 mL as a geometric mean over a 30-day period nor exceed 235/100 mL in any one sample

Water Quality for public water supplies

<u>Parameter</u>	<u>Criteria</u>
Coliform group	5,000/100 mL as a monthly average value (MF or MPN)
Taste and odor producers	shall not interfere with the production of water by conventional treatment
Chlorides or sulfates	not exceed 250 mg/L
Nitrate-N and Nitrite-N	not exceed 10 mg/L combined, nitrite-N shall not exceed 1 mg/L

Appendix A

Listed numeric criteria include (all tables are identified as listed in 327 IAC):

Table 6-1 Bioaccumulative Chemicals of Concern

<u>CAS Number</u>	<u>Substance</u>
57749	Chlordane
72548	4,4'-DDD; p,p'-DDD; 4,4'-TDE; p,p'-TDE
72559	4,4'-DDE; p,p'-DDE
50293	4,4'-DDT; p,p'-DDT
60571	Dieldrin
118741	Hexachlorobenzene
87683	Hexachlorobutadiene; hexachloro-1,3-butadiene
608731	Hexachlorocyclohexanes; BHCs
319846	alpha-Hexachlorocyclohexane; alpha-BHC
319857	beta-Hexachlorocyclohexane; beta-BHC
319868	delta- Hexachlorocyclohexane; delta-BHC
58899	Lindane; gamma- Hexachlorocyclohexane; gamma-BHC
7439976	Mercury
2385855	Mirex
29082744	Octachlorostyrene
1336363	PCBs; polychlorinated biphenyls
608935	Pentachlorobenzene
39801144	photomirex
1746016	2,3,7,8,-TCDD; dioxin
634662	1,2,3,4-Tetrachlorobenzene
95943	1,2,4,5-Tetrachlorobenzene
8001352	Toxaphene

Table 6-2 Substances Treated as Bioaccumulative

<u>CAS Number</u>	<u>Substance</u>
309002	Aldrin
84742	Dibutyl phthalate
72208	Endrin
76448	Heptachlor

Appendix A

Table 8-1 Water Quality Criteria for Protection of Aquatic Life¹

CAS Number	Substances	CMC (Maximum) (ug/L)	CMC Conversion Factors	CCC (4-day Average) (ug/L)	CCC Conversion Factors
	Metals (Dissolved) ²				
7440382	Arsenic (III)	339.8	1.000	147.9	1.000
7440439	Cadmium	$e^{(1.128[\ln(\text{hardness})]-3.6867)}$	0.944	$e^{(0.7852[\ln(\text{hardness})]-2.715)}$	0.909
7440473	Chromium (III)	$e^{(0.819[\ln(\text{hardness})]+3.7256)}$	0.316	$e^{(0.819[\ln(\text{hardness})]+0.6848)}$	0.860
7440473	Chromium(VI)	16.02	0.982	10.98	.962
7440508	Copper	$e^{(0.9422[\ln(\text{hardness})]-1.700)}$	0.960	$e^{(0.8545[\ln(\text{hardness})]-1.702)}$	0.960
7439976	Mercury	1.694	0.850	0.9081	0.850
7440020	Nickel	$e^{(0.846[\ln(\text{hardness})]+2.255)}$	0.998	$e^{(0.8469[\ln(\text{hardness})]+0.0584)}$	0.997
772492	Selenium			5	0.922
7440666	Zinc	$e^{(0.8473[\ln(\text{hardness})]+0.884)}$		$e^{(0.8473[\ln(\text{hardness})]+0.884)}$	0.986
	Organics (total)				
60571	Dieldrin	0.24	NA	0.056	NA
72208	Endrin	0.086	NA	0.036	NA
56382	Parathion	0.065	NA	0.013	NA
87865	Pentachlorophenol ³	$e^{(1.005[\text{pH}]-4.869)}$	NA	$e^{(1.005[\text{pH}]-5.134)}$	NA
	Other Substances				
	Chlorides (total)	860000	NA	230000	NA
	Chlorine (total residual)	19	NA	11	NA
	Chlorine (intermittent, total residual) ⁴	200	NA		NA
57125	Cyanide (free)	22	NA	5.2	NA

¹ Aquatic organisms should not be affected unacceptably if the four (4) day average concentrations of any substance in this table does not exceed the criterion chronic concentration (CCC) more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed the criterion maximum concentration (CMC) more than once every three (3) years on the average, except possibly where a commercially or recreationally important species is very sensitive.

² the CMC and CCC columns of this table contain total recoverable metals criteria (numeric and hardness-based). The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the CMC or CCC. This dissolved CMC or CCC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limits (WQBELs).

³ A CMC and CCC calculated for pentachlorophenol using the equation in this table shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limits (WQBELs).

⁴ To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes duration, and such periods shall be separated by at least five (5) hours. Note: Table 8-2 in the WQS displays CMC and CCCs for several metals at selected hardness concentrations.

Appendix A

Table 8-3 Water Quality Criteria for Protection of Human Health¹

CAS Number	Substances	Human Noncancer Criteria (HNC)		Human Cancer Criteria (HCC)	
		Drinking (ug/L)	Nondrinking (ug/L)	Drinking (ug/L)	Nondrinking (ug/L)
Metals (total)					
7439976	Mercury (including methylmercury)	0.0018	0.0018		
Organics (total)					
71432	Benzene	19	510	12	310
57749	Chlordane	0.0014	0.0014	0.00025	0.00025
108907	Chlorobenzene	470	3200		
50293	DDT	0.002	0.002	0.00015	0.00015
60571	Dieldrin	0.00041	0.00041	6.5×10^{-6}	6.5×10^{-6}
105679	2,4,-dimethylphenol	450	8700		
51285	2,4,-dintrophenol	55	2800		
118741	Hexachlorobenzene	0.046	0.046	0.00045	0.00045
67721	Hexachloroethane	6	7.6	5.3	6.7
58899	Lindane	0.47	0.5		
75092	Methylene chloride	1600	90000	47	2600
1336363	PCBs (class)			6.8×10^{-6}	6.8×10^{-6}
1746016	2,3,7,8,-TCDD (dioxin)	6.7×10^{-8}	6.7×10^{-8}	8.6×10^{-9}	8.6×10^{-9}
108883	Toluene	5600	51000		
8001352	Toxaphene			6.8×10^{-5}	6.8×10^{-5}
79016	Trichloroethylene			29	370
Other substances					
57125	Cyanide (total)	600	48000		

¹ The HNC and HCC are thirty (30) day average criteria.

Table 8-4 Water Quality Criteria for Protection of Wildlife¹

CAS Number	Substances	Wildlife Criteria (ug/L)
Metals (total recoverable)		
7439976	Mercury (including methyl mercury)	0.0013
Organics (total)		
50293	DDT and metabolites	1.1×10^{-5}
1336363	PCBs (class)	1.2×10^{-4}
1746016	2,3,7,8,-TCDD	3.1×10^{-9}

Appendix A

Table 8-9 and 8-10 Additional Criteria for Lake Michigan

Parameter	Criteria	Indicator levels
Dissolved oxygen	Shall not be less than 7.0 mg/L at any time at all places outside the applicable mixing zone	
pH	Maintain between 6.0 and 9.0, fluctuations that exceed 9.0 and are correlated with photosynthetic activity are permitted	7.5 –8.5 su
Chlorides	860 mg/L CMC 230 mg/L CCC	Monthly average 15 mg/l Daily max 20 mg/L
Phenols	See subsection c1	
Sulfates	250 mg/L ¹	Monthly average 26 mg/L Daily max 50 mg/L
Total phosphorus	See 327 IAC 5-10-2	Monthly average 0.03 mg/L Daily max 0.04 mg/L
Total dissolved solids	750 mg/L ¹	Monthly average 172 mg/L Daily max 200 mg/L
Dissolved Iron	300 ug/L ¹	
Fluorides	1.0 mg/L ¹	

¹ The above-noted criteria are established to minimize or prevent increased levels of these substances in Lake Michigan. For the purposes of establishing water quality-based effluent limitations based on the above-noted criteria, they shall be treated as four-day average criteria.

APPENDIX B

Summary of MICHIGAN Water Quality Standards Criteria

Water quality standards applicable to national parks within Michigan are available at
<http://www.epa.gov/ost/standards/wqslibrary/mi/mi.html>

Administrative Rules Part 4: Water Quality Standards. Michigan water quality standards are currently in the triennial review/revision process. Any changes will be printed in the Federal Register.

Waterbodies within Sleeping Bear Dunes National Lakeshore, Pictured Rocks National Lakeshore, and Isle Royale National Park have been designated by the State of Michigan as Outstanding State Resource Waters (OSRW). This is an antidegradation policy designation defining these waters as high quality or important ecological waters. Outstanding State Resource Waters may not be degraded in quality by anthropogenic actions.

323.1100 At a minimum, all surface waters of the state are designated for, and shall be protected for, all of the following uses – agriculture, navigation, industrial water supply, public water supply at the point of water intake, warm water fishery, indigenous aquatic life and wildlife, partial body contact recreation. All surface waters shall be protected for total body contact recreation from May 1 to October 31. All designated Trout Lakes and Trout Streams shall be protected as cold water fisheries. All Great Lakes and connecting waters, except the Keweenaw waterway, shall be protected as cold water fisheries. Michigan's water quality standards for cold water fisheries differ from other waterbody's in dissolved oxygen levels for trout reproduction.

The report “Designated Trout Streams for the State of Michigan” lists trout/cold water streams. The list shows all coastal streams between Kelsey Creek in Baraga County and the Tahquamenon River in Chippewa County are designated as trout streams except for a number of streams, including a tributary to Little Chapel Lake, a tributary to Little Beaver Lake, tributaries to Beaver Lake, two unnamed tributaries to Grand Sable Lake, and Towes Creek. all of which are located in PIRO. Coastal streams in SLBE that are listed as trout streams include Good Harbor Creek, Shalda or Sucker Creek, Crystal River, Otter Creek, one unnamed creek, Platte River (excepting some outlets on Lower Woodcock and Harvey Lakes). (MI 2004).

Actual criteria for Michigan's Water Quality Standards are in table format for toxic pollutants and narrative form for other parameters. The following tables retain the numbering found in the Michigan administrative rules for ease of identification.

Appendix B

Table 1. Aquatic Maximum Values for Protection of Aquatic Life in Ambient Waters

Chemical	AMV ¹ (ug/L)	Conversion Factor (CF)
Arsenic ²	340	1.0
Cadmium ²	(e ^{1.128(lnH)-3.6867})(CF)	1.136672-(lnH)(0.041838)
Chromium (III) ²	(e ^{0.819(lnH)+3.7256})(CF)	0.316
Chromium (VI) ²	16	0.982
Copper ²	(e ^{0.9422(lnH)-1.7})(CF)	0.96
Cyanide ³	22	N/a
Dieldrin ⁴	0.24	N/a
Endrin ⁴	0.086	N/a
Lindane ⁴	0.95	N/a
Mercury ²	1.4	0.85
Nickel ²	(e ^{0.846(lnH)+2.255})(CF)	0.998
Parathion ⁴	0.065	N/a
Pentachlorophenol ⁴	e ^{1.005(pH)-4.869}	N/a
Zinc ²	(e ^{0.8473(lnH)+0.884})(CF)	0.978

¹ AMV is the aquatic maximum value and is equal to ½ the FAV. The AMV shall be rounded to 2 significant digits.

² Value is expressed as a dissolved concentration calculated using the specified conversion factor.

³ Value is expressed as free cyanide.

⁴ Value is expressed as a total concentration.

Note: The term “lnH” is the natural log of hardness, expressed as mg/L CaCO₃

The term “n/a” means not applicable

Table 2. Chronic Water Quality Values for Protection of Aquatic Life in Ambient Waters.

Chemical	FCV ¹ (ug/L)	Conversion Factor (CF)
Arsenic ²	150	1.0
Cadmium ²	(e ^{0.7852(lnH)-2.715})(CF)	1.101672-(lnH)(0.041838)
Chromium (III) ²	(e ^{0.819(lnH)+0.6848})(CF)	0.86
Chromium (VI) ²	11	0.962
Copper ²	(e ^{0.8545(lnH)-1.702})(CF)	0.96
Cyanide ³	5.2	N/a
Dieldrin ⁴	0.056	N/a
Endrin ⁴	0.036	N/a
Mercury ²	0.77	0.85
Nickel ²	(e ^{0.846(lnH)+0.0584})(CF)	0.997
Parathion ⁴	0.013	N/a
Pentachlorophenol ⁴	E ^{1.005(pH)-5.134}	N/a
Selenium ⁵	5	N/a
Zinc ²	(e ^{0.8473(lnH)+0.884})(CF)	0.986

¹ FCV is the final chronic value. The FCV shall be rounded to 2 significant digits.

² Value is expressed as a dissolved concentration calculated using the specified conversion factor.

³ Value is expressed as free cyanide.

⁴ Value is expressed as a total concentration.

⁵ Value is expressed as a total recoverable concentration.

Note: The term “lnH” is the natural log of hardness, as expressed in mg/L CaCO₃

The term “n/a” means not applicable.

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Table 4. Water Quality Values for Protection of Wildlife

<u>Chemical</u>	<u>Wildlife Value (ug/L)</u>
DDT and metabolites.....	0.000011
Mercury, including methylmercury.....	0.0013
PCBs (class).....	0.00012
2,3,7,8-TCDD.....	0.0000000031

Table 5. Bioaccumulative Chemicals of Concern

Chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclohexanes
Alpha-Hexachlorocyclohexane
Beta-Hexachlorocyclohexane
Delta-Hexachlorocyclohexane
Lindane
Mercury
Mirex
Octachlorostyrene
Polychlorinated biphenyls (PCBs)
Pentachlorobenzene
Photomirex
2,3,7,8-TCDD
1,2,3,4-Tetrachlorobenzene
1,2,4,5-tetrachlorobenzene
Toxaphene

(NOTE: According to MI WQS full attempt shall be made to prevent the discharge of these chemicals)

Appendix B

Table 7. Human Noncancer Values for Protection of Human Health

Chemical	HVN Drinking (ug/L)	HNV Nondrinking (ug/L)
Benzene	19	510
Chlordane	0.0014	0.0014
Chlorobenzene	470	3200
Cyanides	600	48000
DDT	0.002	0.002
Dieldrin	0.00041	0.00041
2,4-dimethylphenol	450	8700
2,4-dinitrophenol	55	2800
Hexachlorobenzene	0.046	0.046
Hexachloroethane	6.0	7.6
Lindane	0.47	0.5
Mercury (inc. methylmercury)	0.0018	0.0018
Methylene chloride	1600	90000
2,3,7,8-TCDD	0.000000067	0.000000067
Toluene	5600	51000

Table 8. Human Cancer Values for the Protection of Human Health

Chemical	HCV Drinking (ug/L)	HCV nondrinking (ug/L)
Benzene	12	310
Chlordane	0.00025	0.00025
DDT	0.00015	0.00015
Dieldrin	0.0000065	0.0000065
Hexachlorobenzene	0.00045	0.00045
Hexachloroethane	5.3	6.7
Methylene Chloride	47	2600
2,3,7,8,-TCDD	0.000000086	0.000000086
Toxaphene	0.000068	0.000068
Trichloroethylene	29	370

Other criteria are included in the WQS narrative as;

323.1051 Dissolved Solids

Rule 51.....shall not exceed concentrations injurious to use...not greater than 500 mg/L average or 750 mg/L anytime.....chloride monthly average shall not exceed 50 mg/L in Great Lakes waters

323.1053 pH

Rule 53 pH shall be maintained in the natural range of 6.5 to 9.0, no artificial variation of greater than 0.5 units within that range.

323.1060 Plant nutrients

...shall be limited to prevent excess growth. Discharges effluent limit of 1 mg/L phosphorus.

323.1062 Microorganisms

All waters of the state are designated as full body recreational from 5/1 to 10/31. The 30-day geometric mean for *E. coli* is 130 CFU/100 mL, while the maximum one-time concentration shall not exceed 300 CFU/100 mL. The partial body contact maximum is 1000 CFU/100 mL.

Appendix B

323.1064 Dissolved Oxygen in the Great Lakes, connecting waters and inland streams

All Great Lakes waters and inland cold water fisheries shall maintain at least 7 mg/L dissolved oxygen. All others shall maintain 5 mg/L. During low flow design flows cold water fisheries shall maintain 6 mg/L and warm water fisheries shall maintain 4 mg/L. These standards do not apply to limited warm water fishery or limited cold water fishery use categories.

323.1065 Dissolved Oxygen in inland lakes

All listed cold water lakes shall maintain 7 mg/L dissolved oxygen and in upper strata during stratification. All other lakes shall maintain 5 mg/L in the same conditions.

323.1070 Temperature of Great Lakes and Connecting Waters

No change in temperature greater than 3°F, and in cold water no change greater than 2°F, above background temperatures. Additional tables list monthly maximum temperature for Great Lakes at several locations. Additional regulations limit addition of heat loads to 2-3°F increase above existing natural water temperatures in other conditions.

323.1090 Applicability of Water Quality Standards

- 1) The requirements of these rules shall not apply in mixing zones
- 2) Water quality standards presented in this rule shall apply at all flows equal to or exceeding design flows.

APPENDIX C

Summary of MINNESOTA Water Quality Criteria

Water quality standards applicable to national parks in Minnesota are available at

<http://www.epa.gov/ost/standards/wqslibrary/mn/mn.html> and

<http://www.revisor.leg.state.mn.us/arule/7050/>

All waters within the Voyageur's National Park are designated Outstanding Resource Value Waters, as is the headwaters section of the Mississippi River from Lake Itasca to the southerly boundary of Morrison County. The State prohibits or stringently controls new or expanded discharges from both point or nonpoint sources to Outstanding Resource Value Waters. Minnesota lists the entire St. Croix River as impaired for bioaccumulative toxics, however the St. Croix River and the Kettle River are also listed as ORW. Various tributaries and sections of the Mississippi River are 303(d) listed.

Chapter 7050 Standards for Protection of Quality and Purity

All waters of the State are grouped into one or more of the classes in 7050.200, Use Classifications for Waters of the State. These classes include Class 1 Domestic Consumption, Class 2 Aquatic Life and Recreation, Class 3 Industrial Consumption, Class 4 Agriculture and Wildlife, Class 5 Aesthetic Enjoyment and Navigation, Class 6 Other Uses, and Class 7 Limited Resource Value Waters.

Waterbodies in GRPO are classified as 1B, 2A, 3B. Waterbodies in VOYA are listed as Class 1B, 2A or 2Bd, and 3Aor 3B. Waterbodies in SACN are listed as 1B, 2A or 2Bd and 3B. Waterbodies in MISS are listed as Class 1B, 2A or 2B, and 3B. Not all of the waterbodies in the national parks are classified. Waterbodies not specifically listed for a designated use in 7050.0470 are protected as Class 2B, 3B, 4A, 4B, 5, and 6 waters.

7050.022 Class 2 Waters of the State; Aquatic Life and Recreation

If the standards of this sub-chapter are exceeded in waters of the state that have the Class 2 designation, it is considered indicative of a polluted condition that is actually or potentially deleterious, harmful, detrimental, or injurious with respect to the designated uses. Standards for metals are expressed as total metal but must be converted to dissolved metal standards to determine water quality-based effluent limits.

Class 2A waters; Aquatic Life and Recreation

(The quality of these waters shall be such to permit the propagation and maintenance of a healthy community of cold water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds and are protected as a drinking water source.)

Substance	Units	Chronic Standard	Basis	Class 2A Acute Standards		
				MS	FAV	Basis
Acenaphthene	ug/L	20	HH	56	112	Tox
Acrylonitrile (c)	ug/L	0.38	HH	1140*	2281*	Tox
Alachlor (c)	ug/L	3.8	HH	800*	1600*	Tox
Aluminum, total	ug/L	87	Tox	748	1496	Tox
Ammonia, unionized as N ¹	ug/L	16	Tox	None	None	NA
Anthracene	ug/L	0.035	Tox	0.32	0.63	Tox
Antimony	ug/L	5.5	HH	90	180	Tox
Arsenic, total	ug/L	2.0	HH	360	720	Tox

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Class 2A waters- continued						
Atrazine (c)	ug/L	3.4	HH	323	645	Tox
Benzene (c)	ug/L	9.7	HH	4487*	8974*	Tox
Bromoform	ug/L	33	HH	2900	5800	Tox
Cadmium, total	ug/L	$\text{Exp}^{(0.7852[\ln(\text{total hardness mg/L})]-3.490)}$	Tox	$\text{Exp}^{(1.128[\ln(\text{total hardness mg/L})]-3.828)}$	$\text{Exp}^{(1.128[\ln(\text{total hardness mg/L})]-3.1349)}$	Tox
Carbon tetrachloride (c)	ug/L	1.9	HH	1750*	3500*	Tox
Chlordane (c)	ng/L	0.073	HH	1200*	2400*	Tox
Chloride	mg/L	230	Tox	860	1720	Tox
Chlorine, total residual	ug/L	11	Tox	19	38	Tox
Chlororbenzene	ug/L	20	HH	423	846	Tox
Chloroform (c)	ug/L	53	HH	1392	2784	Tox
Chlorpyrifos	ug/L	0.041	Tox	0.083	0.17	Tox
Chromium +3, total	ug/L	$\text{Exp}^{(0.819[\ln(\text{total hardness mg/L})]+1.561)}$	Tox	$\text{Exp}^{(0.819[\ln(\text{total hardness mg/L})]+3.688)}$	$\text{Exp}^{(0.819[\ln(\text{total hardness mg/L})]+4.380)}$	Tox
Chromium +6, total	ug/L	11	Tox	16	32	Tox
Cobalt	ug/L	2.8	HH	436	872	Tox
Color value	Pt/Co	30	NA	None	None	NA
Copper, total	ug/L	$\text{Exp}^{(0.620[\ln(\text{total hardness mg/L})]-0.570)}$	Tox	$\text{Exp}^{(0.9422[\ln(\text{total hardness mg/L})]-1.464)}$	$\text{Exp}^{(0.9422[\ln(\text{total hardness mg/L})]-0.7703)}$	Tox
Cyanide, free	ug/L	5.2	Tox	22	45	Tox
DDT (c)	ng/L	0.11	HH	550*	1100*	Tox
1,2-Dichloroethane (c)	ug/L	3.5	HH	45,050*	90,100*	Tox
Dieldrin (c)	ng/L	0.0065	HH	1300*	2500*	Tox
Di-2-ethylhexyl phthalate (c)	ug/L	1.9	HH	None*	None*	NA
Di-n-octyl phthalate	ug/L	30	Tox	825	1650	Tox
Dissolved oxygen	mg/L			7.0 as a daily minimum ²		
Endosulfan	ug/L	0.0076	HH	0.084	0.17	Tox
Endrin	ug/L	0.0039	HH	0.090	0.18	Tox
Ethylbenzene	ug/L	68	Tox	1859	3717	Tox
Fecal coliform	CFU	200 CFU/100 mL ³				
Fluoranthene	ug/L	1.9	Tox	3.5	6.9	Tox
Heptachlor (c)	ng/L	0.10	HH	260*	520*	Tox
Heptachlor epoxide (c)	ng/L	0.12	HH	270*	530*	Tox
Hexachlorobenzene (c)	ng/L	0.061	HH	None*	None*	Tox
Lead, total	ug/L	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})]-4.705)}$	Tox	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})]-1.460)}$	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})]-0.7643)}$	Tox
Lindane (c)	ug/L	0.0087	HH	1.0*	2.0*	Tox
Mercury, total	ug/L	0.0069	HH	2.4*	4.9*	Tox
Methylene chloride (c)	ug/L	45	HH	13,875*	27,749*	Tox
Naphthalene	ug/L	81	Tox	409	818	Tox
Nickel, total	ug/L	$\text{Exp}^{(0.846[\ln(\text{total hardness mg/L})]+1.1645)}$	Tox/HH	$\text{Exp}^{(0.846([\ln(\text{total hardness mg/L})]+3.3612)}$	$\text{Exp}^{(0.846([\ln(\text{total hardness mg/L})]+4.0543)}$	Tox
Oil	ug/L	500	NA	5,000	10,000	NA

Appendix C

Class 2A waters - continued						
Parathion	ug/L	0.013	Tox	0.07	0.13	Tox
Pentachlorophenol	ug/L	0.93	HH	$\text{Exp}^{(1.005[\text{pH}]-4.830)}$	$\text{Exp}^{(1.005[\text{pH}]-4.1373)}$	Tox
pH (su)		Not less than 6.5, nor greater than 8.5				
Phenanthrene	ug/L	3.6	Tox	32	64	Tox
Phenol	ug/L	123	Tox	2214	4428	Tox
Polychlorinated biphenyls, total (c)	ng/L	0.014	HH	1000*	2000*	Tox
Radioactive materials	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as permitted by the appropriate authority having control over their use.					
Selenium	ug/L	5.0	Tox	20	40	Tox
Silver, total	ug/L	0.12	Tox	$\text{Exp}^{(1.720[\ln(\text{total hardness mg/L})] - 7.215)}$	$\text{Exp}^{(1.720[\ln(\text{total hardness mg/L})] - 6.520)}$	Tox
Temperature	No material increase					
1,1,2,2-tetra chloroethane (c)	ug/L	1.1	HH	1127*	2253*	Tox
Tetrachloroethylene (c)	ug/L	3.8	HH	428*	857*	Tox
Thallium	ug/L	0.28	HH	64	128	Tox
Toluene	ug/L	253	Tox	1352	2703	Tox
Toxaphene (c)	ng/L	0.31	HH	730*	1500*	Tox
1,1,1-trichloroethane	ug/L	329	Tox	2957	5913	Tox
1,1,2-trichloroethylene (c)	ug/L	25	HH	6988*	13,976*	Tox
2,4,6-trichlorophenol	ug/L	2.0	HH	102	203	Tox
Turbidity value	NTU	10	NA	None	None	NA
Vinyl chloride (c)	ug/L	0.17	HH	None*	None*	NA
Xylene, total m,p,o	ug/L	166	Tox	1407	2814	Tox
Zinc, total	ug/L	$\text{Exp}^{(0.8473[\ln(\text{total hardness mg/L})] + 0.7615)}$	Tox	$\text{Exp}^{(0.8473[\ln(\text{total hardness mg/L})] + 0.8604)}$	$\text{Exp}^{(0.8473[\ln(\text{total hardness mg/L})] + 1.5536)}$	Tox

¹ Ammonia, un-ionized as N. The percent un-ionized ammonia can be calculated for any temperature and pH. See 7050.0222 subpart 2.

² This DO standard require compliance with the standard 50% of the days at which the flow is at 7Q10.

³ geometric mean of not less than 5 samples in any calendar month, not more than 10% shall exceed 400. The standard applies 4/1 through 10/31

(c) = substance is considered carcinogenic

Tox = adverse toxic effects

HH = human consumption of drinking water and sport-caught fish.

*Reference subpart 7, item E, for carcinogenic or highly bioaccumulative chemicals with BCFs greater than 5,000 or log Kow values greater than 5.19 resulting in human health-based CS two or more orders of magnitude small than the acute toxicity-based MS.

Appendix C

Class 2Bd waters

(The quality of Class 2Bd surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. This class of surface waters is also protected as a source of drinking water.) Note that all of the standards in the Class 2A waters are included in Class 2Bd. Those standards that differ between the classes are bolded here.

Substance	Units	Chronic Standard	Basis	Class 2Bd Acute Standards		
				MS	FAV	Basis
Acenaphthene	ug/L	20	HH	56	112	Tox
Acrylonitrile (c)	ug/L	0.38	HH	1140*	2281*	Tox
Alachlor (c)	ug/L	4.2	HH	800*	1600*	Tox
Aluminum, total	ug/L	125	Tox	1072	2145	Tox
Ammonia, unionized as N ¹	ug/L	40	Tox	None	None	NA
Anthracene	ug/L	0.035	Tox	0.32	0.63	Tox
Antimony	ug/L	5.5	HH	90	180	Tox
Arsenic, total	ug/L	2.0	HH	360	720	Tox
Atrazine (c)	ug/L	3.4	HH	323	645	Tox
Benzene (c)	ug/L	11	HH	4487*	8974*	Tox
Bromoform	ug/L	41	HH	2900	5800	Tox
Cadmium, total	ug/L	Exp ^{0.7852[ln(total hardness mg/L)]-3.490}	Tox	Exp ^{(1.128[ln(tatal hardness mg/L)]-1.685)}	Exp ^{(1.128[ln(total hardness mg/L)] -0.9919)}	Tox
Carbon tetrachloride (c)	ug/L	1.9	HH	1750*	3500*	Tox
Chlordane (c)	ng/L	0.29	HH	1200*	2400*	Tox
Chloride	mg/L	230	Tox	860	1720	Tox
Chlorine, total residual	ug/L	11	Tox	19	38	Tox
Chlororbenzene	ug/L	20	HH	423	846	Tox
Chloroform (c)	ug/L	53	HH	1392	2784	Tox
Chlorpyrifos	ug/L	0.041	Tox	0.083	0.17	Tox
Chromium +3, total	ug/L	Exp ^{(0.819[ln(total hardness mg/L)]+ 1.561)}	Tox	Exp ^{(0.819[ln(total hardness mg/L)]+ 3.688}	Exp ^{(0.819[ln(total hardness mg/L)]+ 4.380)}	Tox
Chromium +6, total	ug/L	11	Tox	16	32	Tox
Cobalt	ug/L	2.8	HH	436	872	Tox
Color value	Pt/Co	30	NA	None	None	NA
Copper, total	ug/L	Exp ^{(0.620[ln(total hardness mg/L)]-0.570)}	Tox	Exp ^{(0.9422[ln(total hardness mg/L)]-1.464)}	Exp ^{(0.9422[ln(total hardness mg/L)]-0.7703)}	Tox
Cyanide, free	ug/L	5.2	Tox	22	45	Tox
DDT (c)	ng/L	1.7	HH	550*	1100*	Tox
1,2-Dichloroethane (c)	ug/L	3.8	HH	45,050*	90,100*	Tox
Dieldrin (c)	ng/L	0.026	HH	1300*	2500*	Tox
Di-2-ethylhexyl phthalate (c)	ug/L	1.9	HH	None*	None*	NA
Di-n-octyl phthalate	ug/L	30	Tox	825	1650	Tox
Dissolved oxygen	mg/L	5.0 as a daily average, 4.0 as a daily minimum²				
Endosulfan	ug/L	0.029	HH	0.28	.56	Tox

Appendix C

Class 2Bd waters- continued						
Endrin	ug/L	0.016	HH	0.090	0.18	Tox
Ethylbenzene	ug/L	68	Tox	1859	3717	Tox
Fecal coliform	CFU	200 CFU/100 mL ³				
Fluoranthene	ug/L	1.9	Tox	3.5	6.9	Tox
Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
Hexachloro benzene (c)	ng/L	0.24	HH	None*	None*	Tox
Lead, total	ug/L	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})] - 4.705)}$	Tox	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})] - 1.460)}$	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})] - 0.7643)}$	Tox
Lindane (c)	ug/L	0.032	HH	4.4*	8.8*	Tox
Mercury, total	ug/L	0.0069	HH	2.4*	4.9*	Tox
Methylene chloride (c)	ug/L	46	HH	13,875*	27,749*	Tox
Naphthalene	ug/L	81	Tox	409	818	Tox
Nickel, total	ug/L	$\text{Exp}^{(0.846[\ln(\text{total hardness mg/L})] + 1.1645)}$	Tox/ HH	$\text{Exp}^{(0.846([\ln(\text{total hardness mg/L})] + 3.3612)}$	$\text{Exp}^{(0.846([\ln(\text{total hardness mg/L})] + 4.0543)}$	Tox
Oil	ug/L	500	NA	5,000	10,000	NA
Parathion	ug/L	0.013	Tox	0.07	0.13	Tox
Pentachlorophenol	ug/L	1.9	HH	$\text{Exp}^{(1.005[\text{pH}] - 4.830)}$	$\text{Exp}^{(1.005[\text{pH}] - 4.1373)}$	Tox
pH (su)			Not less than 6.5, nor greater than 9.0			
Phenanthrene	ug/L	3.6	Tox	32	64	Tox
Phenol	ug/L	123	Tox	2214	4428	Tox
Polychlorinated biphenyls, total (c)	ng/L	0.029	HH	1000*	2000*	Tox
Radioactive materials		Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as permitted by the appropriate authority having control over their use.				
Selenium	ug/L	5.0	Tox	20	40	Tox
Silver, total	ug/L	1.0	Tox	$\text{Exp}^{(1.720[\ln(\text{total hardness mg/L})] - 7.215)}$	$\text{Exp}^{(1.720[\ln(\text{total hardness mg/L})] - 6.520)}$	Tox
Temperature	5°F above natural in streams, 3°F in lakes, based on monthly average of the maximum daily temperature, no case exceed daily average of 86°F					
1,1,2,2-tetra chloroethane (c)	ug/L	1.5	HH	1127*	2253*	Tox
Tetrachloro- ethylene (c)	ug/L	3.8	HH	428*	857*	Tox
Thallium	ug/L	0.28	HH	64	128	Tox
Toluene	ug/L	253	Tox	1352	2703	Tox
Toxaphene (c)	ng/L	1.3	HH	730*	1500*	Tox
1,1,1-trichloroethane	ug/L	329	Tox	2957	5913	Tox
1,1,2-trichloro ethylene (c)	ug/L	25	HH	6988*	13,976*	Tox
2,4,6-trichloro phenol	ug/L	2.0	HH	102	203	Tox
Turbidity value	NTU	25	NA	None	None	NA
Vinyl chloride (c)	ug/L	0.18	HH	None*	None*	NA
Xylene, total m,p,o	ug/L	166	Tox	1407	2814	Tox
Zinc, total	ug/L	$\text{Exp}^{(0.8473[\ln(\text{total hardness mg/L})] + 0.7615)}$	Tox	$\text{Exp}^{(0.8473[\ln(\text{hardness mg/L})] + 0.8604)}$	$\text{Exp}^{(0.8473[\ln(\text{hardness mg/L})] + 1.5536)}$	Tox

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Notes for Class 2Bd waters

1 Ammonia, unionized as N. The percent un-ionized ammonia can be calculated for any temperature and pH. See 7050.0222 subpart 2.

² This DO standard require compliance with the standard 50% of the days at which the flow is at 7Q10.

³ geometric mean of not less than 5 samples in any calendar month, not more than 10% shall exceed **2000**. The standard applies 4/1 through 10/31

(c) = substance is considered carcinogenic

Tox = adverse toxic effects

HH = human consumption of drinking water and sport-caught fish.

*Reference subpart 7, item E, for carcinogenic or highly bioaccumulative chemicals with BCFs greater than 5,000 or log Kow values greater than 5.19 resulting in human health-based CS two or more orders of magnitude smaller than the acute toxicity-based MS.

Class 2B waters

(The quality of Class 2B surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable. This class of surface water is not protected as a source of drinking water.)

NOTE: Where standards differ from Class 2Bd they are bolded.

Substance	Units	Chronic Standard	Basis	Class 2B Acute Standards		
				MS	FAV	Basis
Acenaphthene	ug/L	20	HH	56	112	Tox
Acrylonitrile (c)	ug/L	0.89	HH	1140*	2281*	Tox
Alachlor (c)	ug/L	59	HH	800	1600	Tox
Aluminum, total	ug/L	125	Tox	1072	2145	Tox
Ammonia, unionized as N ¹	ug/L	40	Tox	None	None	NA
Anthracene	ug/L	0.035	Tox	0.32	0.63	Tox
Antimony	ug/L	31	HH	90	180	Tox
Arsenic, total	ug/L	53	HH	360	720	Tox
Atrazine (c)	ug/L	10	HH	323	645	Tox
Benzene (c)	ug/L	114	HH	4487	8974	Tox
Bromoform	ug/L	466	HH	2900	5800	Tox
Cadmium, total	ug/L	$\text{Exp}^{0.7852[\ln(\text{total hardness mg/L})-3.490]}$	Tox	$\text{Exp}^{(1.128[\ln(\text{total hardness mg/L})]-1.685)}$	$\text{Exp}^{(1.128[\ln(\text{total hardness mg/L})]-0.9919)}$	Tox
Carbon tetrachloride (c)	ug/L	5.9	HH	1750*	3500*	Tox
Chlordane (c)	ng/L	0.29	HH	1200*	2400*	Tox
Chloride	mg/L	230	Tox	860	1720	Tox
Chlorine, total residual	ug/L	11	Tox	19	38	Tox
Chlororbenzene	ug/L	20	HH	423	846	Tox
Chloroform (c)	ug/L	155	HH	1392	2784	Tox
Chlorpyrifos	ug/L	0.041	Tox	0.083	0.17	Tox
Chromium +3, total	ug/L	$\text{Exp}^{(0.819[\ln(\text{total hardness mg/L})]+ 1.561)}$	Tox	$\text{Exp}^{(0.819[\ln(\text{total hardness mg/L})]+ 3.688)}$	$\text{Exp}^{(0.819[\ln(\text{total hardness mg/L})]+ 4.380)}$	Tox
Chromium +6, total	ug/L	11	Tox	16	32	Tox
Cobalt	ug/L	2.8	HH	436	872	Tox
Color value	Pt/Co	30	NA	None	None	NA

Appendix C

Class 2B waters- continued						
Copper, total	ug/L	$\text{Exp}^{(0.620[\ln(\text{total hardness mg/L})]-0.570)}$	Tox	$\text{Exp}^{(0.9422[\ln(\text{total hardness mg/L})]-1.464)}$	$\text{Exp}^{(0.9422[\ln(\text{total hardness mg/L})]-0.7703)}$	Tox
Cyanide, free	ug/L	5.2	Tox	22	45	Tox
DDT (c)	ng/L	1.7	HH	550*	1100*	Tox
1,2-Dichloroethane (c)	ug/L	190	HH	45,050*	90,100*	Tox
Dieldrin (c)	ng/L	0.026	HH	1300*	2500*	Tox
Di-2-ethylhexyl phthalate (c)	ug/L	2.1	HH	None*	None*	NA
Di-n-octyl phthalate	ug/L	30	Tox	825	1650	Tox
Dissolved oxygen	mg/L	5.0 as a daily average, 4.0 as a daily minimum²				
Endosulfan	ug/L	0.031	HH	0.28	.56	Tox
Endrin	ug/L	0.016	HH	0.090	0.18	Tox
Ethylbenzene	ug/L	68	Tox	1859	3717	Tox
Fecal coliform	CFU	200 CFU/100 mL ³				
Fluoranthene	ug/L	1.9	Tox	3.5	6.9	Tox
Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
Hexachlorobenzene (c)	ng/L	0.24	HH	None*	None*	Tox
Lead, total	ug/L	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})]-4.705)}$	Tox	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})]-1.460)}$	$\text{Exp}^{(1.273[\ln(\text{total hardness mg/L})]-0.7643)}$	Tox
Lindane (c)	ug/L	0.036	HH	4.4*	8.8*	Tox
Mercury, total	ug/L	0.0069	HH	2.4*	4.9*	Tox
Methylene chloride (c)	ug/L	1940	HH	13,875	27,749	Tox
Naphthalene	ug/L	81	Tox	409	818	Tox
Nickel, total	ug/L	$\text{Exp}^{(0.846[\ln(\text{total hardness mg/L})]+1.1645)}$	Tox/ HH	$\text{Exp}^{(0.846([\ln(\text{total hardness mg/L})]+3.3612)}$	$\text{Exp}^{(0.846([\ln(\text{total hardness mg/L})]+4.0543)}$	Tox
Oil	ug/L	500	NA	5,000	10,000	NA
Parathion	ug/L	0.013	Tox	0.07	0.13	Tox
Pentachlorophenol	ug/L	5.5	HH	$\text{Exp}^{(1.005[\text{pH}]-4.830)}$	$\text{Exp}^{(1.005[\text{pH}]-4.1373)}$	Tox
pH (su)		Not less than 6.5, nor greater than 9.0				
Phenanthrene	ug/L	3.6	Tox	32	64	Tox
Phenol	ug/L	123	Tox	2214	4428	Tox
Polychlorinated biphenyls, total (c)	ng/L	0.029	HH	1000*	2000*	Tox
Radioactive materials	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as permitted by the appropriate authority having control over their use.					
Selenium	ug/L	5.0	Tox	20	40	Tox
Silver, total	ug/L	1.0	Tox	$\text{Exp}^{(1.720[\ln(\text{total hardness mg/L})]-7.215)}$	$\text{Exp}^{(1.720[\ln(\text{total hardness mg/L})]-6.520)}$	Tox
Temperature	5°F above natural in streams, 3°F in lakes, based on monthly average of the maximum daily temperature, no case exceed daily average of 86°F					
1,1,2,2-tetra chloroethane (c)	ug/L	13	HH	1127	2253	Tox
Tetrachloroethylene (c)	ug/L	8.9	HH	428	857	Tox
Thallium	ug/L	0.56	HH	64	128	Tox
Toluene	ug/L	253	Tox	1352	2703	Tox

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Class 2B waters - continued						
Toxaphene (c)	ng/L	1.3	HH	730*	1500*	Tox
1,1,1-trichloroethane	ug/L	329	Tox	2957	5913	Tox
1,1,2-trichloroethylene (c)	ug/L	120	HH	6988*	13,976*	Tox
2,4,6-trichlorophenol	ug/L	2.0	HH	102	203	Tox
Turbidity value	NTU	25	NA	None	None	NA
Vinyl chloride (c)	ug/L	9.2	HH	None*	None*	NA
Xylene, total m,p,o	ug/L	166	Tox	1407	2814	Tox
Zinc, total	ug/L	$\text{Exp}^{(0.8473[\ln(\text{total hardness mg/L})] + 0.7615)}$	Tox	$\text{Exp}^{(0.8473[\ln(\text{total hardness mg/L})] + 0.8604)}$	$\text{Exp}^{(0.8473[\ln(\text{total hardness mg/L})] + 1.5536)}$	Tox

¹ Ammonia, un-ionized as N. The percent un-ionized ammonia can be calculated for any temperature and pH. See 7050.0222 subpart 2.

² This DO standard require compliance with the standard 50% of the days at which the flow is at 7Q10. This standard applies to all Class 2B waters except for those portions of the Mississippi River from the outlet of the metro wastewater treatment works in Saint Paul (River Mile 835) to Lock and Dam No. 2 at Hastings (River Mile 815). For this reach of the Mississippi River the standard is not less than 5 mg/L as a daily average from April 1 through November 30, and not less than 4 mg/L at other times.

³ geometric mean of not less than 5 samples in any calendar month, not more than 10% shall exceed **2000**. The standard applies 4/1 through 10/31

(c) = substance is considered carcinogenic

Tox = adverse toxic effects

HH = human consumption of drinking water and sport-caught fish.

*Reference subpart 7, item E, for carcinogenic or highly bioaccumulative chemicals with BCFs greater than 5,000 or log Kow values greater than 5.19 resulting in human health-based CS two or more orders of magnitude small than the acute toxicity-based MS.

Class 2C waters.

The quality of Class 2C surface waters shall be such as to permit the propagation and maintenance of a healthy community of indigenous fish and associated aquatic life, and their habitats. These waters shall be suitable for boating and other forms of aquatic recreation for which the waters may be useable. The standards for Class 2B waters listed above shall apply to these waters except as listed below.

Dissolved oxygen. The dissolved oxygen standard applies to all Class 2C waters except for those portions of the Mississippi River from the outlet of the metro wastewater treatment works in Saint Paul (River mile 835) to Lock and Dam no.2 at Hastings (River Mile 815) and except for the reach of the Minnesota River from the outlet of the Blue Lake wastewater treatment works (River Mile 21) to the mouth at Fort Snelling. For this reach of the Mississippi River the standard is not less than 5 mg/L as a daily average from April 1 through November 30, and not less than 4 mg/L at other times. For the specified reach of the Minnesota River the standard shall be not less than 5 mg/L as a daily average year-round.

Temperature. 5°F above natural in streams and 3°F above natural in lakes, based on monthly average of the maximum daily temperature, except in no case shall it exceed the daily average temperature of 90°F.

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Class 2D waters. The quality of Class 2D wetlands shall be such as to permit the propagation and maintenance of a healthy community of aquatic and terrestrial species indigenous to wetlands, and their habitats. Wetlands also add to the biological diversity of the landscape. These waters shall be suitable for boating and other forms of aquatic recreation for which the wetland may be usable. The standards for Class 2B waters shall apply to these waters except as listed below:

Dissolved oxygen If background is less than 5.0 mg/L as a daily minimum, maintain background (the concentration of the water quality characteristic shall not deviate from the range of natural background concentrations such that there is a potential significant adverse impact to the designated user).

pH Maintain background
Temperature Maintain background

Conversion factors for dissolved metal standards

Metal	Chronic Standard	Maximum Standard and Final Acute Value
Cadmium*	0.909	0.946
Chromium III	0.860	0.316
Chromium VI	0.962	0.982
Copper	0.960	0.960
Lead*	0.791	0.791
Mercury	1.0	0.850
Nickel	0.997	0.998
Silver	0.850	0.850
Zinc	0.986	0.978

*Conversion factors for cadmium and lead are hardness dependent. The values shown in the table are for a total hardness of 100 mg/L (as CaCO₃).

Cd CS=1.101672-[ln total hardness)(0.041838)]
 MS/FAV= 1.136672-[ln total hardness)(0.041838)]

Pb CS/MS/FAV=1.46203-[ln total hardness)(0.145712)]

Definitions of other classes may be of interest in the monitoring project and the Class 4 (Agriculture and Wildlife) category will be described as an example, however, the above Class 2 standards are the most stringent and the most explicit. Meeting the Class 2 standards should meet the other class criteria on a water body with multiple designations.

7050.0224 Class 4 Waters; Agriculture and Wildlife

Wild rice is an aquatic plant resource found in certain waters within the state. The quality of these waters and the aquatic habitat necessary to support the propagation and maintenance of wild rice plant species must not be materially impaired or degraded.

Appendix C

Class 4A waters

The quality of Class 4A waters of the state shall be such as to permit their use for irrigation without significant damage or adverse effects upon any crops or vegetation usually grown in the waters or area, including truck garden crops.

Substance or Characteristic	Class 4A standard
Bicarbonates (HCO_3^-)	5 milliequivalents per liter
Boron (B)	0.5 milligram per liter
pH value	6.0-8.5
Specific conductance	1,000 micromhos/cm at 25°C
Total dissolved salts	700 mg/L
Sodium (Na)	60% of total cations as meq/L
Sulfates (SO_4^{2-})	10 mg/L (applicable to waters used for production of wild rice during the periods when the rice may be susceptible to high levels)
Radioactive materials	Not to exceed the lowest concentrations permitted to be discharged

Class 4B waters (livestock and wildlife) and **Class 4C waters** (wetlands) are described similarly to Class 4A. Class 4C standards state that Class 4A standards apply with the exception of pH being maintained at background and settleable solids not being allowed in concentrations creating potential adverse impacts.

7050.0470 Classifications for waterbodies

in major surface water drainage basins

Streams listed by basin, Town, Range, Section and use can be found at

www.revisor.leg.state.mn.us/arule/7050/0470.html.

*denotes ORW waters

Many of the waterbodies listed for SACN and MISS are tributaries to the main branches that make up the parks, but the mouths of these rivers are included within park boundaries.

For GRPO

Grand Portage Creek	1B, 2A, 3B
Poplar River	1B, 2A, 3B

For VOYA

Cruiser Lake*	1B, 2A, 3B
Kabetogama Lake*	1B, 2Bd, 3A
Mukoda Lake*	1B, 2A, 3B
Sand Point Lake*	1B, 2A, 3A
Rainy Lake*	1B, 2Bd, 3A
Namakan*	1B, 2Bd, 3A
Ash River	1B, 2A, 3B
Moose River	1B, 2Bd, 3B
Johnson Creek	1B, 2A, 3B
Rainy River (outlet to International Falls)	1B, 2Bd, 3A

Appendix C

For SACN

Kettle River*	2B,3B
St. Croix River*	1C, 2Bd, 3B
Sunrise River	1B, 2Bd, 3B
Rush Creek	1B, 2Bd, 3B
Snake Creek	1B, 2A, 3B
Tamarack (upper and lower)	1B, 2Bd, 3B

For MISS

Crow R., North Fork	2B, 3B
Mississippi R.	1C, 2Bd, 3B for the section from the County State Aid Hwy 7 Bridge in St. Cloud to the NW city limits of Anoka 1C, 2BD, 3B from NW Anoka limits to Upper Lock and Dam at Saint Anthony Falls 2C, 3B from the outlet of the Metro WWTP in Saint Paul to Rock Is. Rail Road Bridge (River Mile 83)
Minnesota R.	2C, 3B from River Mile 22 to Mouth
Rush Creek	1B, 2A, 3B
Vermillion R.	1B, 2A, 3B
Rum River*	2B, 3B
Sand Creek	1B, 2A, 3B
Coon Creek	2C
Rice Creek (T35)	2C

7050.0430 Unlisted waters – all surface waters not listed in 7050.0470 and not wetlands, are defined as Class 2B, 3B, 4A, 4B, 5 and 6.

APPENDIX D

Summary of WISCONSIN Water Quality Criteria

Water Quality Standards for the State of Wisconsin can be found at

<http://www.epa.gov/waterscience/standards/wqs/wi/wi.html> and

<http://www.epa.gov/ost/standards/wqslibrary/wi/wi.html>.

Wisconsin categorizes all waters of the state according to the following designated uses (NR102.04); Fish and Other Aquatic Life Uses – Cold water communities, warm water sport fish communities, warm water forage communities, limited forage fish communities, limited aquatic life (marginal surface waters). Recreational Use – A sanitary survey and/or evaluation to assure protection from fecal contamination is the chief criterion determining suitability for recreational use.

Public Health and Welfare – all surface waters shall meet the human threshold and human cancer criteria specified in NR 105.08 and NR105.09

Wildlife Use – all surface waters shall be classified for wildlife uses and meet the wildlife criteria specified in NR105.07.

All waters not specifically listed in NR 102.5 are fish and aquatic life waters.

NR 104 Uses and Designated Standards

Surface waters are classified according to hydrologic characteristics: lakes or flowages, diffused surface waters, wetlands, wastewater effluent channels, non-continuous or continuous streams. Specific designated uses are listed for MISS, SACN, and APIS as follows:

The Mississippi River is used for commercial and recreational fishing, industrial and cooling water supply, boating, hunting, commercial shipping, and waste assimilation. Water quality shall meet the standards and requirements for recreational use and fish and aquatic life.

The St. Croix River has high scenic and aesthetic value and is used for recreation, fishing, hydropower, commercial shipping, stock and wildlife water supply, and waste assimilation. Its water shall meet the standards and requirements for recreational use and fish and aquatic life. The standards for public water supply shall be met downstream of the north line of Polk County. The St. Croix River is listed as ORW except between the St. Croix Falls city limits to one mile below the STH 243 bridge at Osceola, where it is listed as Exceptional Resource Water. The Namakagon River is listed as ORW.

Lake Superior is used for recreation, commercial and recreational fishing, shipping, municipal water supply, industrial and cooling water, and waste assimilation. Lake Superior open waters shall meet the criteria and requirements for public water supplies. All waters of Lake Superior shall meet the standards for recreational use and fish and aquatic life.

NR 102.04(4) Standards for Fish and Aquatic Life uses

Cold water communities include, but are not limited to, surface waters identified as trout waters.

Dissolved oxygen may not be lowered to less than 5 mg/L at any time. Dissolved oxygen in classified trout streams (Wisconsin Trout Streams, 6-3600(80)) or in Great Lakes waters or other cold water community may not be artificially lowered to less than 6.0 mg/L, nor 7.0 mg/L during spawning.

pH shall be maintained between 6.0 to 9.0 with no change greater than 0.5 units outside estimated neutral seasonal maximum and minimum.

Appendix D

NR 102.04(5) Standards for recreational use

Fecal coliforms shall not exceed 200 CFU/100mL as a geometric mean for a 30-day period, nor exceed 400 CFU/100mL in more than 10% of all samples during a month.

Table 1 Calculated Acute Toxicity Criteria for Fish and Wildlife for Substances with Toxicity Unrelated to Water Quality (ug/L, except where indicated)

Substance	Cold water	Warm water sportfish, Warm water forage and Limited forage fish	Limited Aquatic Life
Arsenic (+3)*	339.8	339.8	339.8
Chromium (+6)*	16.02	16.02	16.02
Mercury (+2)*	0.83	0.83	0.83
Cyanide, free	22.4	45.8	45.8
Chlorine*	19.03	19.03	19.03
Gamma-BHC	0.96	0.96	0.96
Dieldrin	0.24	0.24	0.24
Endrin	0.086	0.086	0.12
Toxaphene	0.73	0.73	0.73
Chlorpyrifos	0.041	0.041	0.041
Parathion	0.057	0.057	0.057

*- criterion listed is applicable to the “total recoverable” form except for chlorine which is applicable to the “total residual” form.

Table 2 Calculated Acute Toxicity Criteria for Substances with Toxicity Related to Water Quality (ug/L)

Water Quality Parameter: Hardness (ppm as CaCO₃)
 $ATC = e^{(V \ln \text{hardness} + \ln ACI)}$

Substance	V	ln ACI
Total Recoverable Cadmium:		
Cold water	1.147	-3.8104
Warm water sportfish, warm water forage and limited forage	1.147	-2.9493
Limited aquatic life	1.147	-1.9195
Total Recoverable Chromium(+3): All surface waters	0.819	3.7256
Total Recoverable copper: All surface waters	0.8561	-1.1199
Total recoverable lead: All surface waters	0.9662	0.2226
Total recoverable nickel: All surface waters	1.083	2.2289
Total recoverable zinc: All surface waters	0.8745	0.7634

V= pooled acute slope from the least squares regression of all normalized acute values

ACI =Acute criterion intercept

Water Quality parameter: pH
 $ATC = e^{(V(pH) + \ln ACI)}$

Substance	V	ln ACI
Pentachlorophenol:		
All surface waters	1.0054	-4.877

Appendix D

Table 4 Chronic Toxicity Criteria for Substances with Toxicity related to Water Quality (ug/L)

Water quality parameter: Hardness (ppm as CaCO₃)

$$CTC = e^{(V \ln(\text{hardness}) + \ln CCI)}$$

Substance	V	ln CCI
Total recoverable cadmium:		
All surface waters	0.7852	-2.7150

V= pooled chronic slope from the least squares regression of all normalized chronic values
 CCI =Chronic criterion intercept

Table 5 Calculated Chronic Toxicity Criteria using Acute-Chronic Ratios for substances with Toxicity unrelated to water quality (ug/L)

Substance	Cold water	Warm water sportfish, warm water forage and limited forage fish	Limited aquatic life
Arsenic (+3)*	148	152.2	152.2
Chromium (+6)*	10.98	10.98	10.98
Mercury (+2)*	0.44	0.44	0.44
Cyanide, free	5.22	11.47	11.47
Chlorine*	7.28	7.28	7.28
Dieldrin	0.055	0.077	0.077
Endrin	0.072	0.072	0.10
Parathion	0.011	0.011	0.011

* Criterion listed is applicable to the “total recoverable” form except for chlorine which is applicable to the “total residual” form.

Table 6 Calculated Chronic Criteria using Acute-Chronic ratios for Substances with Toxicity related to Water Quality (ug/L)

Water quality parameter: Hardness (ppm as CaCO₃)

$$CTC = e^{(V \ln(\text{hardness}) + \ln CCI)}$$

Substance	V	ln CCI
Total recoverable chromium (+3):		
Cold water	0.819	0.6851
Warm water sportfish	0.819	1.112
All others	0.819	1.112
Total recoverable copper: all surface waters	0.8561	-1.4647
Total recoverable lead: all surface waters	0.9662	-1.1171
Total recoverable nickel: all surface waters	1.083	0.033
Total recoverable zinc: all surface waters	0.8745	0.7634

Water quality parameter: pH

$$CTC = e^{(V(pH) + \ln CCI)}$$

Substance	V	ln CCI
Pentachlorophenol:		
Cold water	1.0054	-5.1468
All other surface waters	1.0054	-4.9617

V= pooled chronic slope from the least squares regression of all normalized chronic values
 CCI =Chronic criterion intercept

Appendix D

Conversion factors for the conversion of water quality criterion expressed as total recoverable to water quality criterion expressed as dissolved shall be as follows:

	Acute	Chronic
Arsenic	1.000	1.000
Cadmium	0.850	0.850
Chromium (III)	0.316	0.860
Chromium (VI)	0.982	0.962
Copper	0.960	0.960
Lead	0.875	0.792
Mercury	0.850	
Nickel	0.998	0.997
Selenium	0.922	0.922
Silver	0.850	
Zinc	0.978	0.986

Table 7 Wildlife Criteria (ng/L)

Substance	Criteria
DDT & metabolites	0.011
Mercury	1.3
Polychlorinated biphenyls	0.12
2,3,7,8-TCDD	0.003 pg/L

Table 8 Human Threshold Criteria (ug/L unless specified otherwise)

Human threshold criterion (HTC) is the maximum concentration of a substance established to protect humans from adverse effects resulting from contact with or ingestion of the surface waters or aquatic organisms.

Substance	Public Water Supply		Non-public Water Supply		
	Warm water sport fish communities	Cold water ⁴ communities	Warm water forage, and warm water sport fish communities	Cold water communities	Limited aquatic life
Acrolein	7.2	3.4	15	4.4	2800
Antimony ²	10	10	2200	2200	2200
Benzene ²	5	5	610	260	4000
Bis(2-chloroisopropyl) ether	1100	1100	55000	34000	220000
Cadmium ²	10	10	1200	1200	2800
*chlordane (ng/L)	2.4	0.70	2.4	0.70	310000
Chlorobenzene ²	100	100	4900	1600	110000
Chromium (+3)	28000	28000	2500000	2500000	5600000
Chromium (+6)	140	140	13000	13000	28000
Cyanide, total ²	200	200	40000	40000	120000
*4,4'-DDT (ng/L)	3.0	0.88	3.0	0.88	2800000
1,2,-dichlorobenzene ²	600	600	6400	1900	500000
1,3,-dichlorobenzene	1400	710	3300	1000	500000

Appendix D

Table 8 - continued					
Cis-1,2-dichloroethene ²	70	70	14000	9000	56000
Trans-1,2-dichloroethene ²	100	100	24000	13000	110000
Dichloromethane ² (methylene chloride)	5	5	95000	72000	328000
2,4-dichlorophenol	74	58	580	180	17000
Dichloropropenes ³ (1,3-dichloropropene)	8.3	8.2	420	260	1700
*Dieldrin (ng/L)	0.59	0.17	0.59	0.17	280000
2,4-dimethylphenol	450	430	11000	4500	94000
Diethyl phthalate ²	5000	5000	68000	21000	4500000
Dimethyl phthalate (mg/L)	241	184	1680	530	56000
4,6-dinitro-o-cresol	100	96	1800	640	22000
Dinitrophenols ³ (2,4-dinitrophenol)	55	55	2800	1800	11000
2,4-dinitrotoluene	0.51	0.48	13	5.3	110
Endosulfan	87	41	181	54	33600
Ethylbenzene ²	700	700	12000	3700	560000
Fluoranthene	890	610	4300	1300	220000
*Hexachlorobenzene	0.075	0.022	0.075	0.022	4500
Hexachlorocyclopentadiene	50	50	980	310	39000
Hexachloroethane	8.7	3.3	13	3.7	5600
*gamma-BHC (lindane)	0.20	0.20	0.84	0.25	1900
Isophorone	5500	5300	180000	80000	1100000
Lead	10	10	140	140	2240
*Mercury ⁵	0.0015	0.0015	0.0015	0.0015	336
Nickel ²	100	100	43000	43000	110000
*Pentachlorobenzene	0.46	0.14	0.47	0.14	4500
Selenium ²	50	50	2600	2600	28000
Silver	140	140	28000	28000	28000
*2,3,7,8-TCDD (pg/L)	0.11	0.032	0.11	0.032	7300
*1,2,4,5-tetrachlorobenzene	0.54	0.17	0.58	0.17	1700
Tetrachloroethene	5.8	4.6	46	15	1300
Toluene ²	1000	1000	760100	26000	1200000
1,1,1-trichloroethane ²	200	200	270000	110000	2000000
2,4,5-trichlorophenol	1600	830	3900	1200	560000

*Indicates substances that are BCCs.

¹ A human threshold criterion expressed in micrograms per liter (ug/L) can be converted to milligrams per liter (mg/L) by dividing the criterion by 1000.

² For this substance the human threshold criteria for public water supply receiving water classification equal the maximum contaminant level pursuant to s. NR 105.08 (3)(b).

³ The human threshold criteria for this chemical class are applicable to each isomer.

⁴ For BCCs, these criteria apply to all water of the Great Lakes system.

⁵ The mercury criteria were calculated using 20 g/day fish consumption and the human non-cancer criteria derivation procedure in 40 CFR Part 132, Appendix C. For these criteria, 40 CFR Part 132, Appendix C as stated on September 1, 1997 is incorporated by reference.

Appendix D

Table 9 Human Cancer Criteria (ug/L unless specified otherwise¹)

Human cancer criterion (HCC) is the maximum concentration of a substance or mixture of substances established to protect humans from an unreasonable incremental risk of cancer resulting from contact with or ingestion of surface waters and aquatic organisms.

Substance	Public Water Supply		Non-public Water Supply		
	Warm water sport fish communities	Cold water ⁴ communities	Warm water forage, limited forage, and warm water sport fish communities	Cold water communities	Limited aquatic life
Acrylonitrile	0.57	0.45	4.6	1.5	130
Arsenic ²	0.185	0.185	50	50	50
*alpha-BHC	0.012	0.0037	0.013	0.0039	11
*gamma-BHC (lindane)	0.052	0.018	0.064	0.019	54
*BHC, technical grade	0.038	0.013	0.047	0.014	39
Benzene ²	5	5	140	45	1300
Benzidine (ng/L)	1.5	1.5	81	55	300
Beryllium	0.054	0.054	0.33	0.33	16
Bis(2-chloroethyl)ether	0.31	0.29	7.6	3.0	64
Carbon tetrachloride	2.5	2.1	29	9.5	540
*Chlordane (ng/L)	0.41	0.12	0.41	0.12	54000
Chloroethene(vinyl chloride)	0.18	0.18	10	6.8	37
Chloroform (trichloromethane)	55	53	1960	922	11200
*4,4'-DDT (ng/L)	0.22	0.065	0.22	0.065	206000
1,4-Dichlorobenzene	14	12	163	54	2940
3,3'-Dichlorobenzidine	0.51	0.29	1.5	0.46	154
1,2-Dichloromethane	3.8	3.8	217	159	770
Dichloromethane ² (methylene chloride)	5	5	2700	2100	9600
*Dieldrin (ng/L)	0.0091	0.0027	0.0091	0.0027	4400
2,4-Dinitrotoluene	0.51	0.48	13	5.3	110
1,2-Diphenylhydrazine	0.38	0.31	3.3	1.04	88
Halomethanes ³	55	53	1960	922	11200
*Hexachlorobenzene (ng/L)	0.73	0.22	0.73	0.22	44000
*Hexachlorobutadiene	0.59	0.19	0.69	0.2	910
Hexachloroethane	7.7	2.9	11	3.3	5000
N-Nitrosodiethylamine (ng/L)	2.3	2.3	150	140	460
N-Nitrosomethylamine	0.0068	0.0068	0.46	0.46	1.4
N-Nitrosodi-n-butylamine	0.063	0.062	2.5	1.3	13
N-Nitroso dephenylamine	44	23	116	34	13
N-Nitrosopyrrolidine	0.17	0.17	11	11	34
*Polychlorinated biphenyls (ng/L)	0.01	0.003	0.01	0.003	9100
*2,3,7,8-Tetrachloro dibenzo-p-dioxin (pg/L)	0.014	0.0041	0.014	0.0041	930
1,1,2-Tetrachloroethane	1.7	1.6	52	22	350

Appendix D

Table 9 - continued					
Tetrachloroethene	5.8	4.6	46	15	1300
*Toxaphene (ng/L)	0.11	0.034	0.14	0.034	63600
1,1,2-Trichloroethane ²	6.0	6.0	195	87	1200
Trichloroethene ²	5	5	539	194	6400
2,4,6-Trichlorophenol	29	24	30	97	6400

*Indicates substances that are BCCs

¹ A human cancer criterion expressed in micrograms per liter (ug/L), nanograms per liter (ng/L) or picograms per liter (pg/L) can be converted to milligrams per liter (mg/L) by dividing the criterion by 1000, 1,000,000 or 1,000,000,000 respectively.

² For this substance the human cancer criteria for public water supply receiving water classifications equal the maximum contaminant level pursuant to s. NR 105.09(4)(b).

³ Human cancer criteria for halomethanes are applicable to any combination of the following chemicals: bromomethane (methyl bromide), chloromethane (methyl chloride), tribromomethane (bromoform), bromodichloromethane (dichloromethyl bromide), dichlorodifluoromethane (fluorocarbon 12) and trichlorofluoromethane (fluorocarbon 11).

⁴ For BCCs, these criteria apply to all waters of the Great Lakes System.

Waterbodies listed in Wisconsin Trout Streams located in SACN, MISS, or APIS (*indicates ORW)

SAWYER COUNTY

Hatchery Creek
McDermott Brook*
Mosquito Brook*
Strassburg Creek
Pony Creek

WASHBURN COUNTY

2 unnamed Tributaries
Springbrook
Spring Creek
Earl Creek
Boyl Brook
McKenzie Creek
Stuntz Brook

BURNETT COUNTY

Dogtown Creek
Perkins Creek
Hay Creek
Rand Creek
Clemeng Creek
Moore Farm Creek

DOUGLAS COUNTY

Arnold Creek
Potter Creek
Spring (Gordon) Creek
Buckley Creek
Beaver Creek
Bacon Creek

Appendix D

POLK COUNTY

Lagoo Creek
North Creek
Big Rock Creek
Trade River
Silver Brook Creek
Osceola Creek (Trout Brook)

PIERCE COUNTY

Kinnikinnic River*

BAYFIELD COUNTY

Sand River
Tributary to Sand Bay (section 6)

APPENDIX E
EPA NUMERIC CRITERIA

(http://oaspub.epa.gov/pls/wqs/wqsi_epa_criteria.report)
 (accessed on 6/30/05)

Water Quality Standards Database
EPA Numeric Criteria

<u>EPA Pollutant Name</u>	<u>EPA Freshwater CMC</u>	<u>EPA Freshwater CCC</u>	<u>Acute Limit in Saltwater</u>	<u>EPA Saltwater CCC</u>	<u>EPA Human Health Water and Organism</u>	<u>EPA Human Health Organism Only</u>	<u>EPA Pollutant Units of Measurement</u>	<u>EPA Criteria Effective Date</u>
1,1,1-Trichloroethane					Footnote	Footnote		27-Dec-02
1,1,2,2-Tetrachloroethane					0.17	11	ug/L	27-Dec-02
1,1,2-Trichloroethane					0.6	42	ug/L	27-Dec-02
1,1-Dichloroethane								27-Dec-02
1,1-Dichloroethylene					330	7100	ug/L	31-Dec-03
1,2,4-Trichlorobenzene					35	70	ug/L	31-Dec-03
1,2-Dichlorobenzene					420	1300	ug/L	31-Dec-03
1,2-Dichloroethane					0.38	99	ug/L	27-Dec-02
1,2-Dichloropropane					0.52	39	ug/L	27-Dec-02
1,2-Diphenylhydrazine					0.04	0.54	ug/L	27-Dec-02
1,2-Trans-Dichloroethylene					140	10000	ug/L	31-Dec-03
1,3-Dichlorobenzene					400	2600	ug/L	27-Dec-02
1,3-Dichloropropene					0.34	21	ug/L	31-Dec-03
1,4-Dichlorobenzene					63	190	ug/L	31-Dec-03
2,3,7,8-TCDD Dioxin					0.000000013	0.000000014	ug/L	27-Dec-02
2,4,6-Trichlorophenol					2.1	6.5	ug/L	27-Dec-02
2,4-Dichlorophenol					93	790	ug/L	27-Dec-02
2,4-Dimethylphenol					540	2300	ug/L	27-Dec-02
2,4-Dinitrophenol					70	14000	ug/L	27-Dec-02
2,4-Dinitrotoluene					0.11	9.1	ug/L	27-Dec-02
2,6-Dinitrotoluene								27-Dec-02
2-Chloroethylvinyl Ether								27-Dec-02

<u>EPA Pollutant Name</u>	<u>EPA Freshwater CMC</u>	<u>EPA Freshwater CCC</u>	<u>Acute Limit in Saltwater</u>	<u>EPA Saltwater CCC</u>	<u>EPA Human Health Water and Organism</u>	<u>EPA Human Health Organism Only</u>	<u>EPA Pollutant Units of Measurement</u>	<u>EPA Criteria Effective Date</u>
2-Chloronaphthalene					<u>1700</u>	<u>4300</u>	ug/L	27-Dec-02
2-Chlorophenol					<u>120</u>	<u>400</u>	ug/L	27-Dec-02
2-Methyl-4,6-Dinitrophenol					13.4	765	ug/L	27-Dec-02
2-Nitrophenol								27-Dec-02
3,3'-Dichlorobenzidine					<u>0.04</u>	<u>0.077</u>	ug/L	27-Dec-02
3-Methyl-4-Chlorophenol					<u>Footnote</u>	<u>Footnote</u>		27-Dec-02
4,4'-DDD					<u>0.00083</u>	<u>0.00084</u>	ug/L	27-Dec-02
4,4'-DDE					<u>0.00059</u>	<u>0.00059</u>	ug/L	27-Dec-02
4,4'-DDT	<u>1.1</u>	<u>0.001</u>	<u>0.13</u>	<u>0.001</u>	<u>0.00059</u>	<u>0.00059</u>	ug/L	27-Dec-02
4-Bromophenyl Phenyl Ether								27-Dec-02
4-Chlorophenyl Phenyl Ether								27-Dec-02
4-Nitrophenol								27-Dec-02
Acenaphthene					<u>1200</u>	<u>2700</u>	ug/L	27-Dec-02
Acenaphthylene								27-Dec-02
Acrolein					320	780	ug/L	27-Dec-02
Acrylonitrile					<u>0.059</u>	<u>0.66</u>	ug/L	27-Dec-02
Aldrin	<u>3</u>		<u>1.3</u>		<u>0.00013</u>	<u>0.00014</u>	ug/L	27-Dec-02
Anthracene					<u>9600</u>	<u>110000</u>	ug/L	27-Dec-02
Antimony					<u>14</u>	<u>4300</u>	ug/L	27-Dec-02
Arsenic	<u>340</u>	<u>150</u>	<u>69</u>	<u>36</u>	<u>0.018</u>	<u>0.14</u>	ug/L	27-Dec-02
Asbestos					<u>7000000</u>		fibers/L	27-Dec-02
Benzene					<u>1.2</u>	<u>71</u>	ug/L	27-Dec-02
Benzidine					<u>0.00012</u>	<u>0.00054</u>	ug/L	27-Dec-02
BenzoaAnthracene					<u>0.0044</u>	<u>0.049</u>	ug/L	27-Dec-02
BenzoaPyrene					<u>0.0044</u>	<u>0.049</u>	ug/L	27-Dec-02
BenzobFluoranthene					<u>0.0044</u>	<u>0.049</u>	ug/L	27-Dec-02
BenzoghiPerylene								27-Dec-02
BenzokFluoranthene					<u>0.0044</u>	<u>0.049</u>	ug/L	27-Dec-02
Beryllium					<u>Footnote</u>	<u>Footnote</u>		27-Dec-02
Bis2-ChloroethoxyMethane								27-Dec-02

<u>EPA Pollutant Name</u>	<u>EPA Freshwater CMC</u>	<u>EPA Freshwater CCC</u>	<u>Acute Limit in Saltwater</u>	<u>EPA Saltwater CCC</u>	<u>EPA Human Health Water and Organism</u>	<u>EPA Human Health Organism Only</u>	<u>EPA Pollutant Units of Measurement</u>	<u>EPA Criteria Effective Date</u>
Bis2-ChloroethylEther					<u>0.031</u>	<u>1.4</u>	ug/L	27-Dec-02
Bis2-ChloroisopropylEther					<u>1400</u>	<u>170000</u>	ug/L	27-Dec-02
Bis2-EthylhexylPhthalateX					<u>1.8</u>	<u>5.9</u>	ug/L	27-Dec-02
Bromoform					<u>4.3</u>	<u>360</u>	ug/L	27-Dec-02
Butylbenzyl PhthalateW					<u>3000</u>	<u>5200</u>	ug/L	27-Dec-02
Cadmium	<u>4.3</u>	<u>2.2</u>	<u>42</u>	<u>9.3</u>	<u>Footnote</u>	<u>Footnote</u>	ug/L	27-Dec-02
Carbon Tetrachloride					<u>0.25</u>	<u>4.4</u>	ug/L	27-Dec-02
Chlordane	<u>2.4</u>	<u>0.0043</u>	<u>0.09</u>	<u>0.004</u>	<u>0.0021</u>	<u>0.0022</u>	ug/L	27-Dec-02
Chlorobenzene					130	1600	ug/L	31-Dec-03
Chlorodibromomethane					<u>0.41</u>	<u>34</u>	ug/L	27-Dec-02
Chloroethane								27-Dec-02
Chloroform					<u>5.7</u>	<u>470</u>	ug/L	27-Dec-02
Chromium III	<u>570</u>	<u>74</u>			<u>Footnote</u>	<u>Footnote</u>	ug/L	27-Dec-02
Chromium VI	<u>16</u>	<u>11</u>	<u>1100</u>	<u>50</u>	<u>Footnote</u>	<u>Footnote</u>	ug/L	27-Dec-02
Chrysene					<u>0.0044</u>	<u>0.049</u>	ug/L	27-Dec-02
Copper	<u>13</u>	<u>9</u>	<u>4.8</u>	<u>3.1</u>	<u>1300</u>		ug/L	27-Dec-02
Cyanide	<u>22</u>	<u>5.2</u>	<u>1</u>	<u>1</u>	140	<u>140</u>	ug/L	31-Dec-03
Di-n-Butyl PhthalateW					<u>2700</u>	<u>12000</u>	ug/L	27-Dec-02
Di-n-Octyl Phthalate								27-Dec-02
Dibenzoa,hAnthracene					<u>0.0044</u>	<u>0.049</u>	ug/L	27-Dec-02
Dichlorobromomethane					<u>0.56</u>	<u>46</u>	ug/L	27-Dec-02
Dieldrin	<u>0.24</u>	<u>0.056</u>	<u>0.71</u>	<u>0.0019</u>	<u>0.00014</u>	<u>0.00014</u>	ug/L	27-Dec-02
Diethyl PhthalateW					<u>23000</u>	<u>120000</u>	ug/L	27-Dec-02
Dimethyl PhthalateW					313000	2900000	ug/L	27-Dec-02
Endosulfan Sulfate					<u>110</u>	<u>240</u>	ug/L	27-Dec-02
Endrin	<u>0.086</u>	<u>0.036</u>	<u>0.037</u>	<u>0.0023</u>	0.059	0.06	ug/L	31-Dec-03
Endrin Aldehyde					<u>0.76</u>	<u>0.81</u>	ug/L	27-Dec-02
Ethylbenzene					530	2100	ug/L	31-Dec-03
Fluoranthene					<u>300</u>	<u>370</u>	ug/L	27-Dec-02
Fluorene					<u>1300</u>	<u>14000</u>	ug/L	27-Dec-02

<u>EPA Pollutant Name</u>	<u>EPA Freshwater CMC</u>	<u>EPA Freshwater CCC</u>	<u>Acute Limit in Saltwater</u>	<u>EPA Saltwater CCC</u>	<u>EPA Human Health Water and Organism</u>	<u>EPA Human Health Organism Only</u>	<u>EPA Pollutant Units of Measurement</u>	<u>EPA Criteria Effective Date</u>
Heptachlor	<u>0.52</u>	<u>0.0038</u>	<u>0.053</u>	<u>0.0036</u>	<u>0.00021</u>	<u>0.00021</u>	ug/L	27-Dec-02
Heptachlor Epoxide	<u>0.52</u>	<u>0.0038</u>	<u>0.053</u>	<u>0.0036</u>	<u>0.0001</u>	<u>0.00011</u>	ug/L	27-Dec-02
Hexachlorobenzene					<u>0.00075</u>	<u>0.00077</u>	ug/L	27-Dec-02
Hexachlorobutadiene					<u>0.44</u>	<u>50</u>	ug/L	27-Dec-02
Hexachlorocyclopentadiene					40	1100	ug/L	31-Dec-03
Hexachloroethane					<u>1.9</u>	<u>8.9</u>	ug/L	27-Dec-02
Ideno1,2,3-cdPyrene					<u>0.0044</u>	<u>0.049</u>	ug/L	27-Dec-02
Isophorone					<u>36</u>	<u>2600</u>	ug/L	27-Dec-02
Lead	<u>65</u>	<u>2.5</u>	<u>210</u>	<u>8.1</u>	<u>Footnote</u>	<u>Footnote</u>	ug/L	27-Dec-02
Mercury	<u>1.4</u>	<u>0.77</u>	<u>1.8</u>	<u>0.94</u>	<u>0.05</u>	<u>0.051</u>	ug/L	27-Dec-02
Methyl Bromide					<u>48</u>	<u>4000</u>	ug/L	27-Dec-02
Methyl Chloride					<u>Footnote</u>	<u>Footnote</u>		27-Dec-02
Methylene Chloride					<u>4.7</u>	<u>1600</u>	ug/L	27-Dec-02
N-Nitrosodi-n-Propylamine					<u>0.005</u>	<u>1.4</u>	ug/L	27-Dec-02
N-Nitrosodimethylamine					<u>0.00069</u>	<u>8.1</u>	ug/L	27-Dec-02
N-Nitrosodiphenylamine					<u>5</u>	<u>16</u>	ug/L	27-Dec-02
Naphthalene								27-Dec-02
Nickel	<u>470</u>	<u>52</u>	<u>74</u>	<u>8.2</u>	<u>610</u>	<u>4600</u>	ug/L	27-Dec-02
Nitrobenzene					<u>17</u>	<u>1900</u>	ug/L	27-Dec-02
Pentachlorophenol	<u>19</u>	<u>15</u>	<u>13</u>	<u>7.9</u>	<u>0.28</u>	<u>8.2</u>	ug/L	27-Dec-02
Phenanthrene								27-Dec-02
Phenol					<u>21000</u>	<u>4600000</u>	ug/L	27-Dec-02
Polychlorinated Biphenyls PCBs:		<u>0.014</u>		<u>0.03</u>	<u>0.00017</u>	<u>0.00017</u>	ug/L	27-Dec-02
Pyrene					<u>960</u>	<u>11000</u>	ug/L	27-Dec-02
Selenium	<u>Footnote</u>	<u>5</u>	<u>290</u>	<u>71</u>	<u>170</u>	11000	ug/L	27-Dec-02
Silver	<u>3.4</u>		<u>1.9</u>				ug/L	27-Dec-02
Tetrachloroethylene					<u>0.8</u>	<u>8.85</u>	ug/L	27-Dec-02
Thallium					<u>0.24</u>	<u>0.47</u>	ug/L	31-Dec-03
Toluene					1300	15000	ug/L	31-Dec-03
Toxaphene	0.73	<u>0.0002</u>	0.21	<u>0.0002</u>	<u>0.00073</u>	<u>0.00075</u>	ug/L	27-Dec-02

<u>EPA Pollutant Name</u>	<u>EPA Freshwater CMC</u>	<u>EPA Freshwater CCC</u>	<u>Acute Limit in Saltwater</u>	<u>EPA Saltwater CCC</u>	<u>EPA Human Health Water and Organism</u>	<u>EPA Human Health Organism Only</u>	<u>EPA Pollutant Units of Measurement</u>	<u>EPA Criteria Effective Date</u>
Trichloroethylene					<u>2.7</u>	<u>81</u>	ug/L	27-Dec-02
Vinyl Chloride					<u>0.025</u>	<u>2.4</u>	ug/L	31-Dec-03
Zinc	<u>120</u>	<u>120</u>	<u>90</u>	<u>81</u>	<u>9100</u>	<u>69000</u>	ug/L	27-Dec-02
alpha-BHC					<u>0.0039</u>	<u>0.013</u>	ug/L	27-Dec-02
alpha-Endosulfan	<u>0.22</u>	<u>0.056</u>	<u>0.034</u>	<u>0.0087</u>	<u>110</u>	<u>240</u>	ug/L	27-Dec-02
beta-BHC					<u>0.014</u>	<u>0.046</u>	ug/L	27-Dec-02
beta-Endosulfan	<u>0.22</u>	<u>0.056</u>	<u>0.034</u>	<u>0.0087</u>	<u>110</u>	<u>240</u>	ug/L	27-Dec-02
delta-BHC								27-Dec-02
gamma-BHC (Lindane)	<u>0.95</u>		<u>0.16</u>		0.98	1.8	ug/L	31-Dec-03